

WST2

Washington State Technology Transfer



Longitudinal Joint pg 17

In-Street Pedestrian Crossing pg 12

Pavement Management pg 14



**Washington State
Department of Transportation**

A Technical Digest of the
Washington State Department of Transportation (WSDOT)
and the Local Technical Assistance Program (LTAP)

Issue 78, Spring 2003

Washington State Technology Transfer

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Editor reserves the right to refuse to publish and to edit articles to conform to the standards of our publication.

The opinions expressed in articles are not necessarily those of the editor.

Cover Photo by Wendy Schmidt: *The Asphalt Patching Grader Attachment, a Better Mousetrap invented by the WSDOT Port Orchard Maintenance Shop. See the "Build a Better Mousetrap Department" for details.*

Contents

F rom the Editor's Desk	3
--------------------------------	---

T echnology News	4
-------------------------	---

The WST2 Advisory Committee Welcomes Three New Members	4
WSDOT Traffic and Weather Information Site	5
Application of City and County Design Standards	6
WST2 Center Releases New Video - Driving Modern Roundabouts	7
FHWA Announces United States Supreme Court Decision	8
WSDOT New Products Evaluation Procedure	9

A rticles	10
------------------	----

Introducing Building Projects that Build Communities	10
City of Redmond Puts In-Street Pedestrian Crossing Signs to the Test!	12
Developing Full Service Pavement Management at Spokane County	14
Longitudinal Joint Construction Techniques	17
How To Be A Better Team Contributor	20
Reducing Vehicle Crashes	21
Pavement Preservation Beyond the Class 'B' Overlay	22

M ousetraps	24
--------------------	----

WSDOT Kelso Maintenance Guardrail Bolt Puller	24
Tim Van Berkomp's Asphalt Patching Grader Attachment	26

W SDOT Research Office	29
-------------------------------	----

P artnership News	30
--------------------------	----

2002 Partnership for Excellence in Contract Administration Award Winners	30
SR 20/South March Point Road Intersection Project Success	35
The Riverside Bridge Project: Partners Working Together	36
Unique Public-Private Partnership Helps Reduce Commute Trips and Emissions	38
Supervisors Shovel	39

M RSC	40
--------------	----

A New Section to the WST2	40
Selection, Care and Feeding of Your Design Consultant	41
Care and Feeding of Your Consultant	43

Rock and Roll Moments	44
-----------------------	----

N WPMA News	45
--------------------	----

Words from the Chair	45
----------------------	----

U SDOT FHWA/NHTSA	47
--------------------------	----

Meet the Federal Highway Administration's Washington Division Staff in Olympia	47
Guidance on Traffic Control Devices at Highway-Rail Grade Crossings	50
Official Rulings Database	50
Road Symbols and Pavement Markings	51
Click It or Ticket 2003	51

B TEP	52
--------------	----

International Snow Science Workshop: "A Merging of Theory and Practice"	52
--	----

W SDOT Library	53
-----------------------	----

Think Tanks	53
-------------	----

R oger's Technology Toolbox 2002	56
---	----

Technology and the Wireless Evolution	56
---------------------------------------	----

W ST2 Resources	61
------------------------	----

O nline Resources	62
--------------------------	----

T raining Opportunities	64
--------------------------------	----

Local Agency Guidelines (LAG) Training	66
The Endangered Species Act 4(d) Training Program	66

C onferences	69
---------------------	----

S ign of the Times	70
---------------------------	----

Old Meets New	70
---------------	----

What is a modern roundabout?

A modern roundabout is an intersection having a one way circulation around a central island where entering traffic must yield the right-of-way to the traffic circulating the central island.

Enter the Roundabout. Once inside, do not stop. Do not overtake vehicles slightly ahead of yours as they may exit.

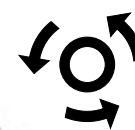


Look for your street sign. Exit the Roundabout toward your destination.



Remember to signal your intent to exit.

Miss Your Exit? No problem-just "go around" one more time.



Refuge Area
Crosswalk
Truck Apron
Sidewalk
Bike Lane
Sidewalk and Bike Lane Combined

Slow Down upon approach. Roundabouts are typically designed for speeds of 15 to 20 mph.



Stop for pedestrians as you approach and exit the roundabout.



Yield to your left before you enter the Roundabout. Remember to be prepared to stop. Wait for a gap in traffic and enter.



Bicycles can use either the pedestrian crossings, the roundabout bypass (when provided), or ride through the roundabout as a motor vehicle



.Pedestrians cross one direction of traffic at a time at designated locations. Look for gaps in traffic.

Cross to the refuge area. Look again and cross.





Dan Sunde
Technology Transfer Engineer
WST2 Center

I'd like to take this opportunity to thank Phil Barto for his 10 years of support and service to the WST2 Center as a member of the WST2 Advisory Committee. With his retirement from Spokane County in April, Phil also resigned from the WST2 Advisory Committee. For the past ten years (the last two years of which he was the committee chair), Phil has participated as a proactive member of the committee, providing valuable input and support for the WST2 Center. We will miss his forward thinking, practical articles, and pragmatic approach to meeting local agency training and technical support needs. Phil, we wish you the very best in your retirement and future endeavors.

I'd like to also thank Bud Cave, Clark County; Bruce Wagner, Pierce County; Mike Sacco, WSDOT Eastern Region; and Jack Zeppenfeld, City of Moses Lake, for accepting positions on the WST2 Advisory Committee. I recognize that their time is more valuable than ever in these lean economic times. We appreciate their willingness to share their time with us to help move the WST2 Center forward to being relevant and effective for Washington's local agencies.

The WST2 Center hosted the Region 10 Local Technical Assistance Program meeting in March for the T2 Centers of Washington, Oregon, Idaho, Alaska, and the Northwest and Alaska tribes. During the meeting Liana Liu, the FHWA Division Coordinator for LTAP, recognized the WST2 Engineer and the WST2 Center for their leadership as a Technology Transfer Center. Liana cited the WST2 newsletter, the Pacific Northwest Transportation Technology Expo, and the "Build a Better Mousetrap" Program as examples of our leadership. We are honored by the recognition and grateful for the tremendous working relationship we have with FHWA, from Washington DC (Al Alonzi and Bill Evans), to the Western Resource Center in Denver (Susanna Hughs Reck), to the Division Office in Olympia (Liana Liu and Cathy Nicholas). Thank you all.

**Secretary of Transportation**

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The Local Technical Assistance Program (LTAP) is a national program financed by the Federal Highway Administration (FHWA) and individual state transportation departments. Administered through Technology Transfer (T2) Centers in each state, LTAP bridges the gap between research and practice by translating state-of-the-art technology into practical application for use by local agency transportation personnel.

Any opinions, findings, conclusions or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.



Washington State
Department of Transportation



U. S. Department of Transportation
Federal Highway Administration

The WST2 Advisory Committee Welcomes Three New Members



Bud Cave



Mike Sacco



Jack Zeppenfield

With retirements and change of duties, three empty positions have been refilled on the WST2 Advisory Committee. Bud Cave, Mike Sacco, and Jack Zeppenfield have stepped forward to join the WST2 Advisory Committee.

Bud Cave, Deputy Operations Manager for Clark County, brings over 30 years of public works experience in all aspects of roadway maintenance and construction. He worked for the city of Vancouver for six years, the Port of Portland for two years, and for Clark County for the past 22 years, with the past 10 years as Deputy Operations Manager. His work experience includes surveying, project inspection, equipment operation, bridgework, and contract administration. Bud also supervised the development and implementation of Clark County's pavement management system and is currently working

on the development of the county's maintenance management system.

Mike Sacco, WSDOT Eastern Region Maintenance Trainer, has over 29 years of public service experience that provides a unique perspective. He started with the Department of Social and Health Services, where he worked for three years before moving to the Washington Military Department, where he worked for five years. He was then promoted to the WSDOT Eastern Region where he started on the I-90 landscape crew, which he refers to as "gardening at 60 mph." Over the years in the Eastern Region Maintenance Office, Mike developed skills as a facilitator and trainer. In 1999 Mike was struck by a motorist and seriously injured. During his recovery, Mike used his training skills and experience to develop a maintenance training program for the Eastern Region that is now being used by all six

WSDOT Regions.

Jack Zeppenfield comes to the committee from the city of Moses Lake, where he is the City's Street Division Supervisor. Jack has a broad background as an equipment operator, mechanic, private business owner, and street maintenance worker. He has over 13 years of experience in municipal public works and street maintenance with heavy emphasis in traffic operations. Jack was on the planning committee for the first Pacific Northwest Transportation Technology Expo, and we look forward to his participation on the Advisory Committee.

Each of our new members brings a wealth of new ideas and enthusiasm to the Advisory Committee. We are fortunate to have them aboard to help guide the WST2 Center in meeting the training and technical needs of Washington's local agencies.



WSDOT

Traffic and Weather Information Site



*By Bob Brooks,
WST2 Pavement Technology Engineer*

The Washington State Department of Transportation (WSDOT) maintains a Traffic and Weather Information web site that is filled with extensive and useful statewide weather and traffic information on the state highway system. WSDOT maintenance managers use the information contained on the web site to support the decision-making process for such activities as crew scheduling and applying anti-icing chemicals and abrasives. This same information could be a helpful decision-support tool to local agencies as well. Even though the information is focused on the state highway system, in most cases, the information would be applicable to the surrounding county and city geographic areas and road systems as well.



WSDOT Traffic and Weather Information Site maps. Site address below.

The information in the Traffic and Weather web site is organized into five areas accessed by selecting tabs at the top of the page. The five informational areas are: Traffic/Cameras, Weather, Mountain Passes, Travel Routes, and Additional Info. The type of information to be found on this web site includes:

- Current statewide road surface temperatures.
- Current and 24-hour forecast road surface temperatures for selected travel routes such as I-5, I-90, US 2, and US 101.
- Current statewide weather conditions at individual stations.
- Statewide weather forecasts by geographic areas.
- Radar rain imagery.
- Various visual and infrared satellite imagery.
- Ferry route wind conditions.

- Highway Advisory Radio (HAR) broadcast messages.
- Statewide traffic cameras.
- Current mountain pass conditions.
- Travel alerts and construction reports.
- Emergency highway closure and traffic incident information.
- Route reports for I-90 and I-5.
- Ferry route information.
- Lake Washington Bridge (I-90 and SR 520) information.

There's a lot of great information here that's updated on a regular basis and it's all free. Check out the web site at <http://www.wsdot.wa.gov/traffic/current/mainbas.htm> and see if this site might be interesting and useful for you.



Application of City and County Design Standards

By Ron Pate, Standards and Procedures Engineer, WSDOT Highways & Local Programs (H&LP)

Washington State law requires cities and counties to comply with uniform design standards: RCW 35.78 applies to cities and RCW 36.86 applies to counties. In addition, when using federal funds, federal regulations require the use of appropriate standards. The Washington State City and County Design Standards Committee is charged with developing the state standards.

Although these standards are included in the Local Agency Guidelines (LAG) Manual, they are an independent document and apply to all construction on city and county facilities, not just those projects containing federal funds. If a specific standard is not included in the City and County Design Standards, the designer is typically referred to the American Association of State Highway and Transportation Officials (AASHTO) guidance.

Recently the Geometric Cross Section Chart, within the standards, has been a topic of debate. The chart contains values for design elements such as lane width, shoulder width, and turn lane width. Recent questions have been raised regarding the basis for values contained in the chart and why AASHTO minimums were not used, avoiding the need for documentation. This article is intended to explain the background and reasoning of the standards.

A review of the 2001 AASHTO publication "A Policy on Geometric

Although these standards are included in the Local Agency Guidelines (LAG) Manual, they are an independent document and apply to all construction on city and county facilities, not just those projects containing federal funds.

Design of Highways and Streets" (the Green Book) and the City and County Design Standards clarifies the reasoning behind the values in the chart. The Green Book utilizes the terms "desirable," "certain circumstances," "cost," and "in some instances." The values listed in the Geometric Cross Section Chart are, for the most part, "desirable" values. Those values can be used "as is" with the chart itself serving as documentation. The Green Book also gives "minimum" values that may be used under certain circumstances. Those circumstances may include, but are not limited to, speed, right of way, volumes, and pedestrian crossings. Making engineering judgments and documentation

of these matters is considered a necessary part of applying the City and County Design Standards to individual projects and is the responsibility of the licensed professional engineer in charge of a project.

The introduction section of the City and County Design Standards sets the foundation for application of the standards to individual projects. It is important for the design professional to apply the standards as a whole and not just selected sections. Below are excerpts from the introduction and comments that address minimums, intent, engineering judgment, and documentation.

■ "The Local Agency Engineer may approve use of minimum AASHTO and related standards as contained in the references. Construction utilizing lesser standards than these must have the approval of the Washington State Department of Transportation (WSDOT) Assistant Secretary for Highways and Local Programs in accordance with RCW 35.78.040 or RCW 36.86.080 as appropriate."

While this gives the Local Agency Engineer the ability to approve AASHTO minimums, it should never be assumed that this is an automatic minimum on any given design element. Footnote (b) of the Geometric Cross Section chart states: "May be reduced to minimum allowed by AASHTO." To go below the minimum, the H&LP Operations Engineer's approval is required as a deviation

from the standards.

■ "These standards cannot provide for all situations. They are intended to assist, but not to substitute for, competent work by design professionals. It is expected that land surveyors, engineers, and architects will bring to each project the best skills from their respective disciplines. These standards are also not intended to limit any innovative or creative effort, which could result in better quality, better cost savings, or both. An agency may adopt higher standards to fit local conditions."

■ "The decision to use a particular road design element at a particular location should be made on the basis of an engineering analysis of the location. Thus, while this document provides design standards, it is not a substitute for engineering judgment."

The two statements above cover the intent of the standards emphasizing they are not intended as a replacement for engineering judgment of design professionals.

■ "There should be some record, not necessarily formal or cumbersome, of the matters considered during the design process that justify decisions made regarding the final project design."

The professional engineer in charge of the project must evaluate each design situation. If less than the desirable value is chosen, appropriate documentation, explaining the reasons and conclusions, should be placed in the agencies design files. While the standards do not dictate a stringent level of documentation, agencies are reminded that project documentation is subject to review. Decisions should be documented whether the standards are followed as written or minimums are used.



WST2 Center Releases New Video - *Driving Modern Roundabouts*



By Dave Sorensen,
Traffic Technology Engineer,
WST2 Center



The WST2 Center recently completed production of the video *Driving Modern Roundabouts*. This was a three-way partnership among the cities of Olympia and Lacey, and WSDOT. The ten-minute video gives instruction about something new that local drivers are encountering on the road. The two cities approached the WST2 Center, asking for help in producing a video to teach drivers the rules of the road for driving modern roundabouts.

Periodic broadcast is underway in the greater Olympia area on local public access channel Thurston County Television, TCTV, Channel 3. The production is continuously replayed in half-hour and hour time slots. TCTV will continue

broadcasts through July 2003.

The city of Olympia was so impressed with the cooperative effort and the video itself, they awarded the video production team members with a certificate of appreciation during a recent city council meeting.

VHS, DVD or CD copies are available from the WST2 Center. The video is also available for viewing on WSDOT's web page at http://www.wsdot.wa.gov/eesc/cae/DesignVisualization/Video/Portfolio/Modern_Roundabouts/index.htm.



For more information please contact Dave Sorensen at (360) 705 7385 or at sorensd@wsdot.wa.gov.

FHWA Announces

United States Supreme Court Decision

Reprint from FHWA Memorandum from A. George Ostensen, Associate Administrator for Safety, dated March 28, 2003

On January 14, 2003, the United States Supreme Court issued its decision that upheld the constitutionality of Section 409 of Title 23 (discovery and admission as evidence of certain reports and surveys). In a unanimous decision, the Court determined that Section 409 was a valid exercise of Congress' authority under the Commerce Clause of the Constitution. In response to several inquiries that we have received since the decision, we would like to offer the following additional guidance.

First, we want to reiterate that in this particular case, the Supreme Court accepted the Federal Government's interpretation that Section 409 only protects the information that was compiled or collected for Section 409 purposes (that is, to provide safety data, as required by 23 U.S.C. 130, 144, 152, or the development of any highway safety construction improvement project utilizing Federal funds).

The test applied by the Supreme Court was to determine whether or not the custodian of the document actually compiled or collected the information for a Section 409 purpose. For example, if a plaintiff in a tort case sought discovery from a county sheriff's office seeking all

The test applied by the Supreme Court was to determine whether or not the custodian of the document actually compiled or collected the information for a Section 409 purpose.

crash reports that the office had in its possession, and if the sheriff's office collected and filed those reports for law enforcement purposes, then Section 409 would not apply. However, if the plaintiff seeks crash reports that the sheriff's office had collected and filed for Section 409 purposes (e.g. the preparation of spot maps where crashes occurred), then those reports that the sheriff's office collected for the preparation of the spot map, as well as the spot map itself, would be protected by Section 409.

We also want to emphasize that we believe that Section 409 is a privilege that cannot be waived by a State, county or municipality. The purpose of this section is to protect the flow of information required to administer the Federal program. Section 409 is a grant condition that the State agrees to

when it participates in the Hazard Elimination Program, and it must therefore abide by this condition.

There were a number of issues that the Supreme Court's decision did not address. One such issue involves the situation where a State or local government stores crash report information only in a single set of electronic files that all government agencies having a need for such information could access by the use of a networked computer system. In such a situation, we believe that Section 409 would apply to all crash reports contained within the system, regardless of the agency that may possess or retrieve a report. This is so because all of the crash reports in such a system would be stored in the database, at least in part, for a Section 409 eligible purpose.

We therefore believe that integrated databases should not be modified solely because of Section 409 concerns. While we cannot rule out the possibility of future legal challenges on this issue, we believe that the benefits of integrating databases far outweigh the disadvantages and that every effort should continue to be made to improve the quality of these databases.



For additional information, please contact Mr. Kenneth Epstein (202) 366-2157.

WSDOT

New Products Evaluation Procedure

By Bob Brooks, WST2 Pavement Technology Engineer

The Washington State Department of Transportation (WSDOT) has a process in place to evaluate new products and procedures that may be approved for the Department's use on construction and maintenance projects.

The evaluation process involves several steps and can be a relatively short or fairly lengthy process depending upon many variables, including the product or procedure to be evaluated, availability of test sites and crews, product performance, and safety. Once a new product "Application for Evaluation" form is completed, the product/procedure is directed to the specific section to which the product/procedure is best suited. For example, pothole-patching material will be directed to Maintenance. An evaluation is then begun to see if the product/procedure is useful or beneficial to the Department. Evaluators use all available information to better understand the product/procedure and its performance, including regulatory and testing institutions such as the American Association of State and Highway Transportation Officials (AASHTO), the Highway Innovative Technology Evaluation Center (HITEC), etc. Many products will require field-testing for a full evaluation; sometimes this process can be lengthy.

Once the evaluation is completed, the findings and recommendation(s) are presented to the WSDOT New Products Committee for action. Once the Committee has reached a decision, the evaluation requestor will be notified of the Committee's action. Typically, the Committee's action falls into one of the following categories:

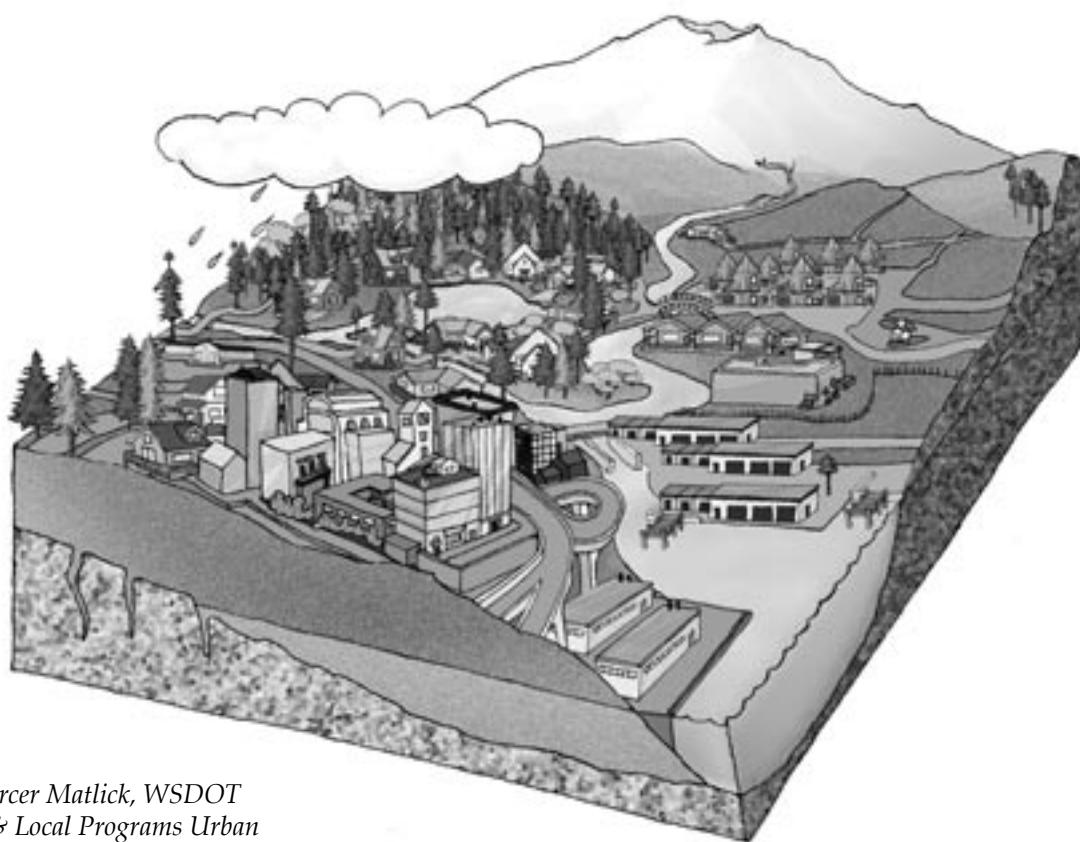
- Product/Procedure Approved
- Product/Procedure Not Approved
- Product Meets Current Specifications
- Non-Interest or Limited Use Item

Manufacturers and vendors interested in submitting a product/procedure for evaluation should fill out the "Application for Evaluation" form as completely as possible. In addition, any information that may be pertinent to the evaluation process, such as product brochures, testing reports, etc., should be included with the form. If field or laboratory testing is required, the submitter will be contacted and requested to furnish samples.

Application forms and additional information are available on the WSDOT New Products web site at http://www.wsdot.wa.gov/biz/mats/New_prod/.



Introducing *Building Projects that Build Communities*



By Julie Mercer Matlick, WSDOT
Highways & Local Programs Urban
Partnerships Manager

The Washington State Department of Transportation (WSDOT) has just released a new handbook to help local agencies and WSDOT work together on transportation projects to meet our citizens' needs. It is titled *Building Projects that Build Communities* and represents the first product the agency has produced to implement our Context Sensitive Solutions initiative. What are Context Sensitive Solutions (CSS)?

Sometimes also termed context sensitive design or CSD, CSS are shared, interdisciplinary techniques that involve all partners to develop a transportation facility that fits its physical surroundings and preserves scenic, aesthetic, historic, and environmental resources and community values, while maintaining safety and mobility. CSS considers the total context in which a transportation

improvement project will exist. Last year WSDOT sponsored two forums to introduce context sensitive solutions to the Northwest: a regional workshop and an international symposium.

Building Projects that Build Communities resulted from an unusual and exciting Community Partnership Forum that worked to consider the best ways to plan and

The document is intended to (1) expedite projects so they reduce costly delays, (2) address and balance local and regional transportation needs (encouraging partnering), and (3) consider all concerns and issues upfront to prevent redo or rework costs later in the project.

develop projects where different levels of government must solve intricate and interrelated problems in order for a project to succeed. In 2001, WSDOT's Highways and Local Programs Division convened this forum that was tasked with improving WSDOT's interactions with local jurisdictions, particularly on projects planned, scoped, and built within urban areas.

As a result, the forum developed the concept for the best practices guidebook, *Building Projects that Build Communities*, as a resource for both local agencies and WSDOT staff to help local

agencies understand the process for developing a project from beginning to end and to describe helpful tools all transportation agencies can employ to ensure successful partnering projects.

The document is intended to (1) expedite projects to reduce costly delays, (2) address and balance local and regional transportation needs (encouraging partnering), and (3) consider all concerns and issues up front to prevent redo or rework costs later in the project.

Building Projects that Build Communities contains chapters on effective communication, project advocacy and management, conflict resolution, how to identify and involve appropriate community partners, how to keep projects and teams on track, and much more. In addition to very practical project management applications, it contains numerous resources, such as team agreement forms and team evaluations, to assist transportation professionals working with communities and others.

Building Projects that Build Communities has been sent to all public transportation agencies in Washington State and is available on-line to others at www.wsdot.wa.gov/biz/csd. It is also on the 4th edition of WST2's Technology Transfer CD Library, Spring 2003. Contact the WST2 Center by e-mail at schmidw@wsdot.wa.gov for your copy of the CD.



Sometimes also termed context sensitive design, or CSD, CSS are shared, interdisciplinary techniques that involve all partners to develop a transportation facility that fits its physical surroundings and preserves scenic, aesthetic, historic, and environmental resources and community values, while maintaining safety and mobility.

For information on community partnerships, contact WSDOT's Highways and Local Programs Community Resource Center at <http://www.wsdot.wa.gov/TA/PAandI/CommPart/> or contact Julie Mercer Matlick at (360) 705-7505.

City of Redmond Puts In-Street Pedestrian Crossing Signs to the Test!

By Susan Byszeski, Traffic Safety Education Specialist

Driver inattention is one of the biggest threats to pedestrian safety. Five years after the start of Redmond's nationally recognized targeted crosswalk enforcement program, the City still hears complaints about drivers who fail to stop for pedestrians in marked crosswalks. Most drivers claim they don't see pedestrians. This is a common excuse we thought might be addressed with in-street pedestrian crossing signs.

In-street pedestrian crossing signs are being tested in many cities on the East Coast. They were first seen in Washington D.C. by Lieutenant John Miner, Operations Support for the city of Redmond Police Department. The signs are installed in the center of the roadway at marked crossings. They command attention because of their unique location. Test cities report an increase in driver compliance where the devices are being used. The city of Redmond thought the signs had merit. With Federal Highway Administration approval and a grant from the Washington Traffic Safety Commission to purchase the signs, the City embarked on a test in Redmond to evaluate the concept.

The city of Redmond wanted to see if a sign positioned in the direct line of sight for drivers raised the level of safety for pedestrians at test crossings. Although the City had many marked crosswalks that were considered potential test sites, the



Closeup of an In-Street Pedestrian Crossing sign

number of sites was limited to ten for efficient study and evaluation. The test sites were selected to provide a cross-section of almost every city setting. There are signs in the downtown and on residential, commercial, and retail streets. All of the test signs are at crosswalks with identified pedestrian concerns, on roadways with one through lane in each direction, and where the posted speed is no higher than 30 MPH. Most of the signs are at uncontrolled midblock locations.

In-street pedestrian crosswalk devices are not proprietary. There

are several types on the market. After looking at quite a few, we chose a sign with an internal mechanism that enables the sign to flex and spring back into place in the event of vehicular impact. The sign has been crash tested in work zones at speeds up to 60 MPH, but a few were lost to vehicular hits in the early stages of the test, perhaps more the result of misjudged placement than a failure of the product's flexibility. The sign is permanently installed in the street, attached to an anchor plate that is bolted into the pavement. They are easy to install and cost approximately \$110 per sign. The sign stands 4 feet high, and the sign face is 12 inches wide, which is the standard distance from one edge of a centerline raised pavement marker to the other. We wanted the message on the sign to be clear and direct. Pedestrian law in Washington State requires drivers to "stop for pedestrians," which is what the test sign says.

The City's general test parameters are modeled after a 1999 field experiment with a similar device in Madison, Wisconsin. Redmond's signs were installed on December 10, 2002. Our test will last for a year. Before the signs were installed, we performed pedestrian field studies at every test location. We recorded all attempts at pedestrian crossings when vehicles were present. The following questions were asked regarding observed driver behavior: Did the first approach driver stop for the pedestrian to cross? Did a subsequent driver stop? Was the



Installed In-Street Pedestrian Crossing sign

crossing ultimately unsuccessful because no drivers stopped for the pedestrian? The same observation methods will be used for the first post-installation study in April and for those to follow in August and December. While Redmond's test is scheduled to last until December 2003, the device may be adopted in the upcoming 2003 revision to the Manual on Uniform Traffic Control Devices (MUTCD). In addition to guidelines provided by the MUTCD, our own experience will help us determine appropriate applications for this device.

Most of the East Coast cities contacted by the city of Redmond commented on the high level of community response and media attention that was generated by in-street pedestrian crossing signs.

The City knew the signs would get noticed and an unconventional approach to a sensitive issue, like pedestrian safety, would likely push people out of their comfort

The City knew the signs would get noticed and an unconventional approach to a sensitive issue, like pedestrian safety, would likely push people out of their comfort zones.

zones. Comments from the Redmond community were, and continue to be, overwhelmingly favorable. Pedestrians say they notice more drivers stopping at the test crossings, where previously they were failing to do so. Drivers say they notice the sign from a

great distance and appreciate the advanced warning of a crosswalk. The signs, however, have angered a few drivers; they see them as inconvenient obstacles in the road.

So far the test signs show some evidence of wear and tear. All but one are still standing. Early one morning in the first week of the test, Redmond Police Dispatch received a call reporting a neighborhood crosswalk on fire. Emergency response crews arrived at the urban trail crossing to see the in-street pedestrian crossing sign in flames. When the fire was out, all that was left of the sign was ashes and the spring mechanism from inside the sign. The fire was undoubtedly a deliberate act and it is unlikely that the circumstances of the fire will ever be known. We do know our vendor has supplied thousands of signs to cities along the eastern seaboard, but the city of Redmond is the first to report a combustible sign. ▲

Developing Full Service Pavement Management at Spokane County

By Phillip J. Barto, P.E., Maintenance Engineer, Spokane County

Full service pavement management uses a single set of pavement rating data and provides information for all agency requirements, including major reconstruction, pavement rehabilitation, maintenance operations, and general information. This seems like a simple concept, but it is anything but simple. Because of the differing needs, data must be collected on small road segments. It is easy to evaluate the individual segments, and it is easy to assess the overall condition of a road but, because of the sheer volume of information, it is difficult to combine the segments to analyze project size sections of road. Many agencies that are involved with pavement management have not been able to overcome the difficulty. They use the system simply to enumerate the overall condition of their system, which is important. However, a good pavement management system is capable of much more. Spokane County recognized the value early on and took the challenge. Now the pavement management department is providing meaningful information for a variety of requirements:

- Develop the six-year construction program.
- Prioritize roads for the overlay program.
- Prioritize roads for the chip seal program.
- Develop pavement maintenance and repair projects.

- Develop pavement crack filling projects.
- Brief county commissioners and others on the overall state of the roads.
- Provide pavement condition information to the County Road Administration Board as mandated.

Pavement management actually began at Spokane County in 1981, about one year after the maintenance management system was established. All maintenance management systems are based on four categories of information:

- What work should be done?
- How much work should be done?
- When should the work be done?
- Where should the work be done?

It is usually easy to get the first three based on the maintenance staff's expertise. The question of which roads need what work is more difficult. Most local agencies have enough miles of roads that even the best managers cannot remember everything. They have a good idea of the overall condition, but they can remember little detail. Worse yet, they can easily forget some of the less important roads that may need work.

The selection of projects is further complicated because the roads are not uniformly good or bad. Even the worst roads have some segments that are in relatively good condition

and visa versa. Our objective was to find a way to quantify the condition of our paved roads accurately and give them a numerical rating. Chip seals are the mainstay of the Spokane County pavement maintenance program, and our first order of business was to determine the right time to seal. Most roads need repair before the seal, that decision automatically sets up several repair activities. Some of these activities are drainage repairs, crack filling, base repairs, and blade patching. Therefore, the rating system actually drives several maintenance programs.

Our search led us to a simplified pavement rating system from one of the Asphalt Institute manuals developed around 1977. We modified it for our needs and used it to evaluate surface conditions, prioritize our work on roads, and establish an annual program. The system was simple and fast to use, and it gave good information. However, it provided only a general estimate on the amount of repair work. We obtained precise information inspecting the road and preparing a detailed estimate for the project. We soon learned approximately how much money we would need to allocate for each repair activity for each mile of road based on the score. Next, we expanded the one-year program into a three-year chip seal and pavement repair plan.

Spokane County established a Pavement Management Section and purchased the Road Rater for testing

pavement structural condition in 1989. The section was assigned to the Design Department, and like many agencies, there was little communication between Maintenance and Design. The Maintenance Department seldom used the Road Rater information.

In the early 1990's, WAC 136.320 mandated the implementation of a pavement management system to guide the pavement preservation and rehabilitation activities on paved county arterial roads. Spokane County's Design Department began visual pavement rating in 1992. We used the Washington State City and County rating method. It provided pavement surface condition ratings on one-tenth mile segments. Road Rater data was also available on one-tenth mile segments. We had a lot of data on some very small segments. However, was that what we really wanted?

We could find no easy way to use the data to determine the condition of a project length section of road. We had data on approximately 15,000 individual segments of roads. It was too cumbersome to do any more than rate the overall condition of the system. We were operating two parallel pavement management systems to get everything we needed.

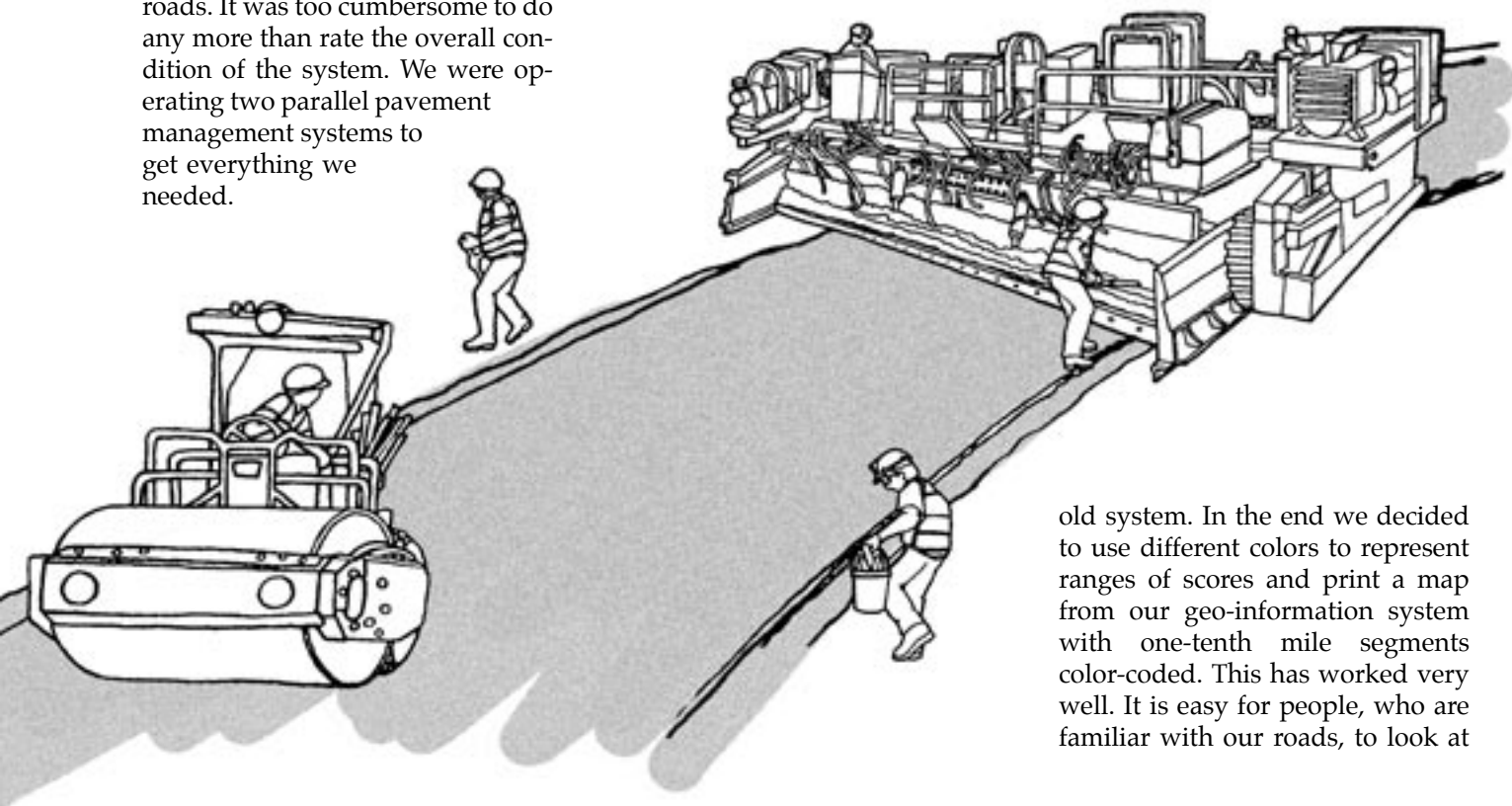
Pavement Management was transferred to the Maintenance Department in 1999. It never made sense to operate two systems, so we began to develop our full service pavement management program. We thought we should be able to meet all needs with one set of data. If we were successful, the Pavement Management Section would become responsible to provide information to both Design and Maintenance. That would be more efficient and effective.

The challenge of pavement management for maintenance was to combine the information from the small road segments into project length sections. After some searching and evaluating, we purchased Centerline Pavement Management Software. We chose it because many of the standard reports supported our needs and all information was available in Excel or Access spreadsheets. This flexibility was important to the County and provided a distinct advantage. It was easy to sort and add information to make

custom reports. We could build our reports the way we wanted, and we did not have to go to the vendor, wait until our need became a priority, and pay for an extra feature.

For the first two years we continued to operate our parallel systems. For Maintenance, we were trying to develop the confidence in the new system that we had in our old one. In 2001 we switched exclusively to the pavement management system. By then the Road Rater had also proved to be a valuable diagnostic tool, and we used it regularly for repair and reconstruction decisions.

When using the Centerline software, we found it difficult to combine the small segments to prioritize project road sections logically. Averaging segments frequently gave an unrealistic score because the average of the good or bad segments tainted the information. We found that using the mean score gave somewhat better information, but it still was not as good as our



old system. In the end we decided to use different colors to represent ranges of scores and print a map from our geo-information system with one-tenth mile segments color-coded. This has worked very well. It is easy for people, who are familiar with our roads, to look at

the map and give it a logic check. From looking at the map, we can select roads for chip seals, overlays, and complete reconstruction. When we do the actual inspection, we find that we are usually right.

After using this process for a while, we found that we could easily predict the amount of work that a segment of road would require by looking at the scores. It was easy to develop a maintenance budget for the work or to prioritize the work if there was a budget shortage.

In its current form, the Spokane County Pavement Management program is serving the original requirements and is still capable of doing more. Using the pavement management software, the County is able to model repair and reconstruction activities and compare the costs of repair strategies. We are working to set up the data screens to start doing that.

The Spokane County approach to pavement management is to build a foundation with good data and then expand. Like any computer program, this information is only as good as the data that we input. We have seen many cases where agencies have purchased software and they immediately think it will do all things for all departments. When the project fails, the software is blamed. The truth is that the computer does not make the decisions. The managers make the decisions. The computer and its software are only decision-making tools that depend on the users to set parameters. Pavement Management software is no exception.

It takes time to develop a good pavement management program, and it is time consuming to use it. There are many trials and tribulations along the way. At times, we knew that it would have been easier to stay with our old two-system method. After putting in the time

to set it up properly, the system has already proved its value. As we continue to work with it, we expect it to get better.

In Local Government a good pavement maintenance program is one that balances needs.

- Apply reasonable effort to minor maintenance on good roads.
- Allocate reasonable effort to major repairs and reconstruction.
- Apply reasonable effort to band-aid failed roads.

There are advantages to using a three-year pavement maintenance plan:

- It is better for budget allocation.
- Some of the repair’s work better over two seasons.
- It costs less to crush larger quantities of rock, and the rock is located in the right place.



Pavement Repair Alternatives

Rating Range	Treatment
85 TO 100	None
71 TO 84	Crack fill, light repair, chipseal
61 TO 70	Medium repair, chipseal, overlay
41 TO 60	Major repair, chipseal, overlay
0 TO 40	Rehabilitation

Longitudinal Joint Construction Techniques

Reprinted from "TECH NOTES", a publication by the Environmental and Engineering Program Materials Laboratory to share design and construction technology gained from projects or research performed.



Figure 1. Joint in Washington with raveling and cracking present.

Background

Distresses caused by poor longitudinal joint construction can result in the premature failure of multilane hot mix asphalt (HMA) pavements. These distresses are often in the form of raveling and eventually cracking (Figure 1). The cause is attributed to relatively low density and surface irregularity at the joint. Low density at the joint is not unusual since the edge of the lane first paved (cold lane) is unconfined. The subsequent lane (hot lane) has a confined edge and therefore tends to have a higher density, but still does not typically meet the minimum requirements.

Because these irregularities exist, techniques for proper construction should be identified and used to ensure improved performance and longer lasting pavements.

A report titled *Evaluation of Eight Longitudinal Joint Construction Techniques for Asphalt Pavements in Pennsylvania*¹ is the primary source of information contained within this edition of TechNotes. The report was produced based on findings from the Pennsylvania Department of Transportation (PennDOT) and the National Center for Asphalt Technology (NCAT). This study was done on 5 projects that were constructed in Michigan (1992), Wisconsin (1992), Colorado (1994), Pennsylvania (1995) and New Jersey (1996). This TechNote will concentrate on the Pennsylvania test sections with one additional joint construction technique used in Michigan and Colorado.

Construction of the Pennsylvania test sections was done in Lancaster County in mid-September of 1995. Each of the eight test sections was 500 feet in length and consisted of

a 1.5-inch thick wearing course (see Table 1 for gradation) with ambient air temperatures ranging from 48 to 72°F. The overlap of new (hot) mix onto the cold lane was 1 to 2 inches with the idea that it would be luted so as to provide additional material at the joint to achieve higher density. However, this material was broadcast across the hot mat (up to 1½ feet) and therefore defeated the purpose of the overlap.

Joint Construction Techniques

The eight types of construction techniques used in Pennsylvania include the following:

1. **Joint Maker** - Consists of a boot-like device that is about 3 inches wide and is attached to the side of the screed, at the corner, during construction (Figure 2). The device forces extra material at the joint and a kicker plate lutes back the overlapped material so that raking is eliminated. The rolling was accomplished from the hot side with a 6-inch overlap on the cold lane (see technique 2).

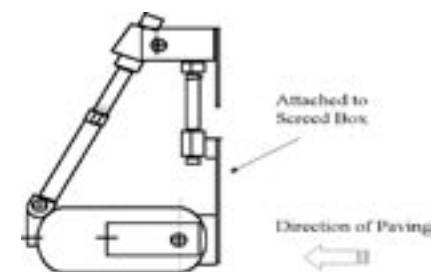


Figure 2. Joint maker.

2. **Rolling From Hot Side** - The initial pass was compacted from the hot side with a 6-inch overlap on the cold lane (Figure 3). The break-down roller made 2 passes (forward and backward) in vibratory mode at this location.

Table 1. Gradation for Pennsylvania mix.

Sieves	1/2"	3/8"	4	8	6	30	50	100	200	%AC
% Passing	100	98	68	45	25	15	11	8	5	6.0



Figure 3. Rolling from hot side.

3. *Rolling From Cold Side* - Initial compaction was from the cold side with a 6-inch overlap on the hot lane (Figure 4). The first pass (majority of roller wheel on cold lane) was made in the static mode and the second pass (backward) was made in the vibratory mode with a 6-inch overlap on the cold lane.



Figure 4. Rolling from cold side.

4. *Rolling From Hot Side Away From Joint* - Compaction began with the roller edge approximately 6 inches from the joint on the hot side (Figure 5). Both passes (forward and backward) were made in vibratory mode with the second pass overlapping the cold lane by 6 inches.

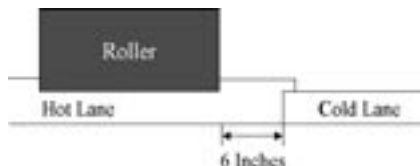


Figure 5. Rolling from hot side away from joint.

5. *Cutting Wheel* - This technique cuts 1 to 2 inches off the unconfined, low-density edge of the initial lane after compaction, while the mix is still plastic. The cutting wheel is placed on the intermediate roller to produce a vertical edge, with higher density. The vertical edge was covered with an AC-20 tack coat prior to the placement of the second lane. Rolling was performed from the hot side with approximately 6 inches on the cold lane (technique 2).

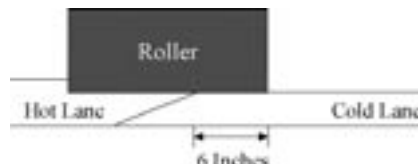


Figure 6. New Jersey Wedge (3:1).

6. *Edge Restraining Device* - This device provides restraint of the hot-mix on the first lane of construction. A 3-inch wide wheel with a 45-degree bevel is attached to the breakdown roller. When the device is lowered, the roller passes within 6 inches of the edge and it offers restraint at the edge of the first lane constructed. Two passes in the static mode were made with this device. The breakdown roller then finished compaction, including the 6-inches not already compacted. The adjacent lane was then compacted following technique 2.



Figure 7. Notched wedge joint.

7. *Rubberized Asphalt Tack Coat* - A rubberized asphalt tack coat (Crafco pavement joint adhesive) was applied to the unconfined edge of the cold lane. The tack coat was approximately 1/8-inch thick. Rolling was performed from the hot side (technique 2).

8. *New Jersey Wedge (3:1)* - A wedge joint was created using a sloping steel plate attached to the inside corner of the paver screed extension (no compaction of the wedge itself). This formed a 3:1 taper while constructing the cold lane (Figure 6). The breakdown roller stayed 3 to 5 inches away from the tapered edge. The adjacent lane was placed with an infrared heater preheating the wedge to approximately 200°F prior to rolling from the hot side (technique 2).

The Michigan² and Colorado³ projects utilized a step wedge joint (Figure 7), very similar to what has been used in Washington State over the past few years.

The Michigan project utilized HMA that had approximately 12 percent passing the 1/2-inch sieve and retained on the 3/8-inch sieve. The vertical offset was 1/2 inch and the taper was 12:1 (compacted with a small roller wheel attached to the trailing edge of the screed). The Colorado project utilized HMA that had approximately 17 percent passing the 3/4-inch sieve and retained on the 1/2-inch sieve. With the larger aggregate size, the vertical offset was 1 inch and the taper was 3:1. The adjacent lane was compacted according to technique 2 and the tapered face was tacked in both cases.

Test Results

Core samples were obtained at the joint and 12 inches from the joint on the cold side for the Pennsylvania project. Density determinations were then made, including the percent air voids. Table 2 illustrates the average air voids at the specified joint type.

Table 2. Percent air voids at the pavement joint.

Joint Type	Mean	Std. Dev.
Joint Maker	9.2	0.94
Rolling from hot side	10.3	1.49
Rolling from cold side	9.3	2.36
Hot side 6 inches away	10.0	1.29
Cutting wheel	8.7	2.16
Edge restraining device	7.7	1.78
Rubberized Joint Material	12.9	1.53
New Jersey Wedge (3:1)	14.8	2.15
Michigan Wedge (12:1)	8.8	—
Colorado Wedge (3:1)	9.2	—

Table 3. Six year field evaluation of longitudinal joints
(organized by rating)

Joint Type	Avg. Rating	% Length	Avg. Width (mm)	% Length
Rubberized Joint Material	9.88	0	—	2
Cutting wheel	9.12	6	6.25	0
Hot side 6 inches away	8.75	6	3	8
New Jersey Wedge (3:1)	7.75	3	2	4
Edge restraining device	6.75	35	4.75	8
Joint Maker	5.50	85	9.5	0
Rolling from hot side	4.75	99	6.25	0
Rolling from cold side	4.62	88	9.5	0

Since construction, yearly evaluations were made, with the last visual performance evaluation made in July 2001. Performance data collected over this period of time, including the initial density measurements, has identified which construction technique resulted in the best functioning joint over time (Table 3).

Performance Observations

In the early stages, some of the joints appeared to perform better than others, regardless of density. As time progressed, environmental conditions allowed for several of the joints to worsen, especially during cold winters. The joints constructed by rolling from the hot side, rolling from the cold side, and the joint maker went from being rated as three of the top four in 1997, to the three worst in 2001, due to almost continuous cracking at the joint. On the other hand, the joints constructed with the rubberized material, cutting wheel, and rolling from the hot side 6 inches away were able to maintain a tight joint with minimal to no cracking and raveling.

Based on the six-year field performance of the different longitudinal joints constructed in Pennsylvania and relevant NCAT experience in Michigan, Colorado, and Wisconsin, the following ranks the techniques according to performance.



Figure 8. Rubberized joint material.

Longitudinal joints constructed using rubberized joint material (Figure 8) gave the best performance with no significant cracking, closely followed by the cutting wheel. However, the quality of the joint with the cutting wheel is dependent upon the skill of the operator.



Figure 9. Rolling from hot side 6 inches away from joint.

The test section that constructed the joint by rolling from the hot side 6 inches away (Figure 9) and the New Jersey wedge also performed well with no significant cracking. However, the section with New

Jersey wedge (without a notch) showed raveling 2 to 3 inches wide at the joint.

The notched wedge joint, like that used in Michigan and Colorado, would have prevented the raveling and also allowed higher density at the joint (Table 2).

Test sections using the edge-restraining device, joint maker (Figure 10), rolling from hot side (Figure 11), and rolling from cold side (Figure 12) developed cracking at the longitudinal joint anywhere from 35 to 99 percent of the test section.



Figure 10. Joint maker.



Figure 11. Rolling from hot side.

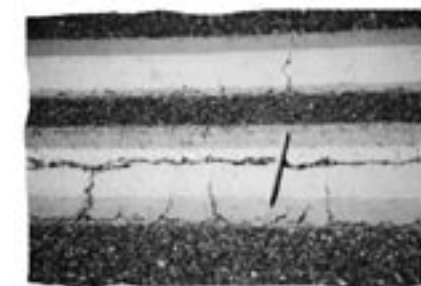


Figure 12. Rolling from the cold side.

Overall performance of rolling from the cold side resulted in a wider and deeper crack than compared to rolling from the hot side.

Conclusions

It is recommended that all rolling should be performed from the hot side, no matter which type of joint is constructed. This allows the use of a vibratory roller in the first pass and generally results in higher density. If just a change in roller operations is used, rolling from the hot side 6 inches away from the joint should be utilized. If a different type of joint is considered, using rubberized joint material and/or the use of a notched wedge joint (12:1), or a cutting wheel, will give the best overall performance in terms of durability.

The final recommendation is to specify a minimum joint density. Generally, this should be 2 percent lower than what is allowed for mainline; however, NCAT recommends that air voids be no more than 10 percent.

▲
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Footnotes

1 *Evaluation of Eight Longitudinal Joint Construction Techniques for Asphalt Pavements in Pennsylvania*. P. Kandhal, et al. July 2001. In *81st Annual Proceedings of Transportation Research Board*, paper number 02-2451, January 2002.

2 *Evaluation of Longitudinal Joint Construction Techniques for Asphalt Pavements*. P. Kandhal, et al. *Transportation Research Record* 1469.

3 *Study of Longitudinal-Joint Construction Techniques in Hot-Mix Asphalt Pavements*. P. Kandhal, et al. *Transportation Research Record* 1543.

How To Be A Better Team Contributor

By Robert Bacal, M.A.

More and more often, employees are expected to contribute to the performance and success of their work teams. While it sounds great on paper, it isn't all that easy to work in a team, since often team members are different in style, attitude, commitment and work ethic. If you are a work team member or supervise, manage or lead a team, take a good look at these tips and hints which will make it easier for team members to contribute more productively to their team and decrease friction among team members!

Stop The Blaming Cycle

Often teams get bogged down in blaming members when things go wrong. As a team member you can do two things to stop this wasteful and destructive team behavior. First, eliminate blaming language you may use. Replace blaming and finger-pointing comments or questions with a focus on solving problems or preventing problems. Second, if other team members get into the blaming cycle, step in and "turn" the conversation back to a constructive approach. For example, here's a good phrase: "Ok, maybe we could save some time here by trying to ensure that the problem doesn't happen again, so what can we do to prevent it next time?"

Focus On The Present And Future

This is related to the blaming cycle. Don't dwell on the past. Use the past (successes and team failures) to help the team determine where they need to go to improve. You can't change the past -- you can only use it to learn from.

Stop Back Channel Talk

Talking about a team member in private with another team member usually involves a blaming process. While sometimes it's good to vent frustration about a fellow teammate, you shouldn't be doing it within the team. It's counter productive, and harmful. Stop doing it unless you have a specific, constructive reason for doing so.

Personal Responsibility

Take responsibility for your behavior and the results that your team produces, but NOT the behavior of your teammates. When you take responsibility for another member's actions, you will tend to want to change your teammate, something that often creates dissension.

Finally, focus on YOUR contributions. Don't spend your time thinking about or telling teammates what THEY should be doing for the team. Think about what you can contribute, and how you can contribute more effectively. Then do it. For example, if you have a great suggestion, don't dump it on the group with the expectation that someone else will implement it. You offer to do it...after all it's your suggestion.

▲
Robert Bacal is a noted author, keynote speaker, and management consultant. His most recent books include *Performance Management - A Briefcase Book* and *The Complete Idiot's Guide To Managing Difficult Employees*. For more information contact Robert Bacal at ceo@work911.com or by phone at (204) 888-9290.

Reducing Vehicle Crashes

By Dave Sorensen, WST2 Traffic Technology Engineer

If you read the headline "Plane Down - No Survivors Found," would it get your attention? Sure it would! Consider, hypothetically, that a plane carrying 115 passengers crashes each day for a year. The reality is that approximately 115 people are killed each day on our nation's highways. The number is unacceptable and can be lowered significantly. Traffic crashes and fatalities affect the lives of most Americans. Many of us, myself included, have lost parents, siblings, children, relatives, and friends to the tragic crashes that take place on our nation's highways every day.

It is a fact that vehicle crashes are a greater threat to life and health in the U.S. than crime. In 2000 there was one murder every 34 minutes, while one person died from a traffic crash every 13 minutes. There was one violent crime every 22 seconds but one crash-related injury every 10 seconds. Traffic crashes are the leading cause of death in the U.S. among people ages 6-33, and the economic cost is estimated to be \$230.6 billion per year, or 2.3 percent of the U.S. gross domestic product (GDP).

Lives can be saved and crashes reduced on our highways by increasing our nation's focus on reducing driver inattention and drunken driving, increasing the use of seat belts and child safety restraints, and improving our signs and roads.

What Can We Do?

There are three primary components to highway safety: 1) driver behavior, 2) vehicle equipment, design, and maintenance, and 3) roadway design, signage, and road improvements. Reducing our nation's highway death toll will require continued improvements in all three areas.

■ **Driver Behavior** - Drunk driving, speeding, and drowsy, aggressive, and distracted driving continue to be major problems on our roads and bridges. Motorists should slow down, drive defensively, and wear all appropriate protective gear - like seat belts and motorcycle helmets. Bicyclists and pedestrians need to be especially alert and careful. In 1999 bicyclists accounted for 13% of all non-motorist traffic fatalities, and in 2001 over 4,800 pedestrians were killed.

■ **Vehicle Equipment, Design and Maintenance** - Today's passenger vehicles are safer than ever. Advancements such as integrated seat belts, air bags, anti-lock braking, improved seat design, new crumple zone technology, and other safety features mean motorists and passengers are able to walk away from crashes that once claimed lives. These vehicle improvements will continue; however, owners must properly learn to use the new technologies for them to be effective. Drivers must also keep their cars and trucks well

maintained to ensure proper performance.

■ **Roadway Design, Signage and Road Improvements** - Substandard road conditions, obsolete designs, and roadside hazards contribute to more than 15,000 highway deaths annually - nearly a third of all fatal crashes. Roadway improvements such as wider lanes, stripes, and shoulders; better lighting and brighter, highly-reflective signs and devices; intersection improvements; median barriers; and rumble strips will help save lives on our nation's highways.

We all take driving for granted. When getting behind the wheel you expect to arrive at your destination safely. When boarding a plane that little voice in your mind may say, what if? What if something goes wrong? The reality is that air travel is by far safer than driving. Why is it when a plane crashes, the headline grabs your attention for several days, yet a car crash is forgotten as soon as you drive by?

The next time you buckle-up behind the wheel, consider that you might not be coming back. Crashes happen to other people, not you, right? We, as drivers, pedestrians, bicyclists, traffic safety professionals, and lawmakers, can make a difference. Each one of us should take a personal interest in traffic safety.



Pavement Preservation Beyond the Class 'B' Overlay

By Ken Garmann, Senior Project Manager, City of Bothell

An introduction by Dave Zabell, Director of Public Works, City of Bothell

Historically public works professionals have prided themselves on devising and implementing new and more efficient ways to extend the useful life of public street systems, and in this time of tight budgets, shrinking resources, and high demands, that is even more relevant. At the city of Bothell, a western Washington city, we have great success with chip and slurry seals in our arsenal for combating the deterioration of our streets. Ken Garmann, Senior Project Manager, has been the City's point person for the past three seasons on this largely successful program. You will see from Ken's article below that the cost savings of employing these treatments, as opposed to asphalt overlay, are substantial; our biggest problem in using these applications in our environment is political, not technical. The article provides some lessons learned regarding the use of slurry and chip seals in an urban environment, an environment where these methods are not frequently used. Finally, you will come away from this article with an appreciation of why you assign a project with potential adverse public reaction to a person like Ken - a sense of humor helps you get through the tough times.

From the Beginning

Since its inauguration in 1999, the City's Annual Pavement Preservation Program has been developed with an emphasis on the City's 32 miles of arterial streets. During the 2001-2006 Six-Year Transportation Improvement Program (TIP) process, it became

apparent that funding was needed to support a preservation program for the City's 72 miles of residential streets. Acting on a recommendation from the Public Works Department, the City Council included \$130,000 in the 2001 budget to fund the residential street preservation program. A three-point program, consisting of (1) asphalt overlays, (2) chip seals,

In an effort to counteract adverse public opinion to chip seal projects, Doolittle Construction Inc. worked extremely hard to pick up and remove debris left over from the initial product application.

and (3) slurry seal treatments, was implemented as the residential pavement preservation program. The 2002 program was funded with \$500,000 from arterial streets, \$130,000 from the residential streets program, and a one-time transfer of \$160,000 in funds from prior years. To maximize project dollars, staff elected to develop the project plans and specifications internally rather than hiring outside vendors.

Into The Eye of the Storm

In the fall of 2001, buoyed by the success of the previous year's chip seal program, City staff began the selection of prospective streets for the 2002 program. Based upon the field condition of the streets, it was determined that those selected from the Shelton View Sub-area would receive double-shot applications of chip seal, while 240 Street SW, a major neighborhood collector, would receive a single-shot of chip seal. All prospective streets would receive a fog seal (an oil emulsion application to improve chip embedment and surface seal) approximately ten days after the chip seal was placed.

In July the City Council agreed to enter into a contract with Doolittle Construction Inc. to perform the 2002 chip seal application.

Wipe Out

In late August Doolittle Construction Inc. began application of chip seal on all the streets in their contract. The following day, they completed the double-shot application of chip seal and completed clean up and sweeping of surplus rock chips off the streets. Ten days after the chip seal applications, Doolittle Construction Inc. applied the fog seal coat to the streets.

In an effort to counteract adverse public opinion to chip seal projects, Doolittle Construction Inc. worked extremely hard to pick up and remove debris left over from the initial product application. When

The test patch was left for the local residents to test drive, observe, and critique prior to another resident meeting scheduled for the following evening.

the fog seal application was completed, the contractor had constructed a textbook quality project.

Shortly after work began, the City began receiving phone calls from irate property owners complaining about the application process, texture, and surface finish of the chip seal on the streets. Most of the calls came from the neighbors on First Avenue W and 239 Street SW. Calls and e-mails continued into the weekend. There were calls to the Mayor and several Council members who responded with an impromptu Sunday evening meeting with neighborhood residents. The Public Works staff met individually with property owners who agreed to wait until the fog seal was applied before pursuing additional remediation.

Once the fog seal was applied, the property owners again registered their complaints against the application of the chip seal. The City requested a neighborhood meeting to discuss issues associated with the residents' complaints. After the local residents voiced their concerns, it was agreed the City would run a test patch of slurry seal (another preservation program under contract) and reconvene a second meeting to determine a course of action.

Black is Black

The third leg in the City's 2002 Annual Pavement Preservation Program is a slurry seal which consists of a mixture of one-quarter inch minus chipped stone and sand mixed with asphalted emulsion to form a thin pavement covering intended to fill surface cracking, seal the surface from moisture, and replace and extend the life of the roadway driving surfacing. Selected streets included the Bridalwood Subdivision, with streets approximately eight years old and Wilshire and Kensington Court, with streets between 10 and 12 years old.

Even though the slurry seal process is not a common maintenance technique in the Puget Sound Region, it was agreed by City Council to allow staff to negotiate a sole source contract with Blackline Inc.

Blackline Inc. applied a 100-foot by 8-foot test patch of slurry at the entrance of First Avenue W.

The test patch was left for the local residents to test drive, observe, and critique prior to another resident meeting scheduled for the following evening. Most of the local residents attended the Wednesday evening meeting. Again the residents voiced their objections but agreed to test the slurry seal process, which covered the chips extremely well but left an abrasive texture with surface screed seams evident.

The slurry seal was scheduled to begin near the middle of September and an informational neighborhood newsletter was mailed to property owners in advance of the work being performed.

The slurry application process includes mixing the product in a truck-mounted pug mill, applying

the product to the full width of the street, and curing it for approximately three to four hours. Approximately 20,000 square yards were applied daily with treated streets closed until 5:00 pm each day. The entire project was scheduled to be completed in four working days. The contractor's crews worked diligently and were well trained in slurry seal application. The traffic control flaggers did a heroic job of setting road closures, traffic control, and pedestrian assistance during the four days of intense production.

Between a Rock and a Hard Place

The public reaction and non-acceptance of the chip seal efforts was a downside to the success of the overall 2002 Annual Pavement Preservation Program. Important lessons learned include an improved public notification process during preliminary project design and construction, greater scrutiny of street candidates during the review and selection process to include streets that will support the appropriate applications, and finally, the development of a public awareness program designed to educate local residents to the long term advantages and values of alternative preservation, including chip seals and slurry seals.

Overall, the 2002 Annual Pavement Preservation Program was extremely successful, netting nearly seven miles of road treatment on six percent of the City's residential streets. In terms of cost, asphalt overlays averaged \$34.09 per linear foot; chip seal applications were \$5.61 per linear foot, and slurry seals were \$5.01 per linear foot.



WSDOT Kelso Maintenance Guardrail Bolt Puller

By Roger Chappell, WST2 Technology Integration Engineer

Have you ever had one of those tools around the maintenance yard that was designed with one purpose in mind: to make a difficult task easier? That was the purpose of the guardrail bolt puller, invented by Chon Yanez, Maintenance Tech 2; Don Avery, Mechanic; and Jeff Jackson, Mechanic of WSDOT Kelso Maintenance Shop. It solved the problem of removing 18-inch guardrail bolts from damaged guardrail. Before the guardrail bolt puller was invented, another bolt or some type of drift pin was driven into a hole from the other side of the post to remove the old bolt. With the guardrail bolt puller, you simply remove the nut from the end of the bolt, strike the end of the bolt with a sledgehammer to raise the head, and slip the puller under the head of the bolt. The slide hammer action then allows for relatively easy bolt extraction.

The guardrail bolt puller was an adaptation of a slide hammer dent puller used in auto body repairs. It took some experimentation to develop a puller head that would be strong enough to hold up to the pounding and still slide in easily behind the bolt head.

While the Kelso Maintenance crew still uses the bolt puller in some locations, they have mostly gone to the use of a cutoff saw for guardrail removal. Normally, where bent bolts are a problem, the rail is also mangled. The Maintenance crew now saw the rail and cut off the posts, removing it in larger pieces and eliminating some of the labor associated with disassembling.

If you are faced with the task of disassembling and reconstructing of existing guardrail, you might consider making a guardrail bolt puller for the job. It has proven to be a tool that saves time and effort for the WSDOT Kelso Maintenance crew. Most of the materials used in constructing the bolt puller were from odds and ends from around the Shop. With a little creativity, the cost to build one could be minimal.

Russ Smalley was the Maintenance Supervisor at the time of the development and construction of the bolt puller. From my perspective, the guardrail bolt puller is another successful team effort by the WSDOT Kelso Maintenance Shop.



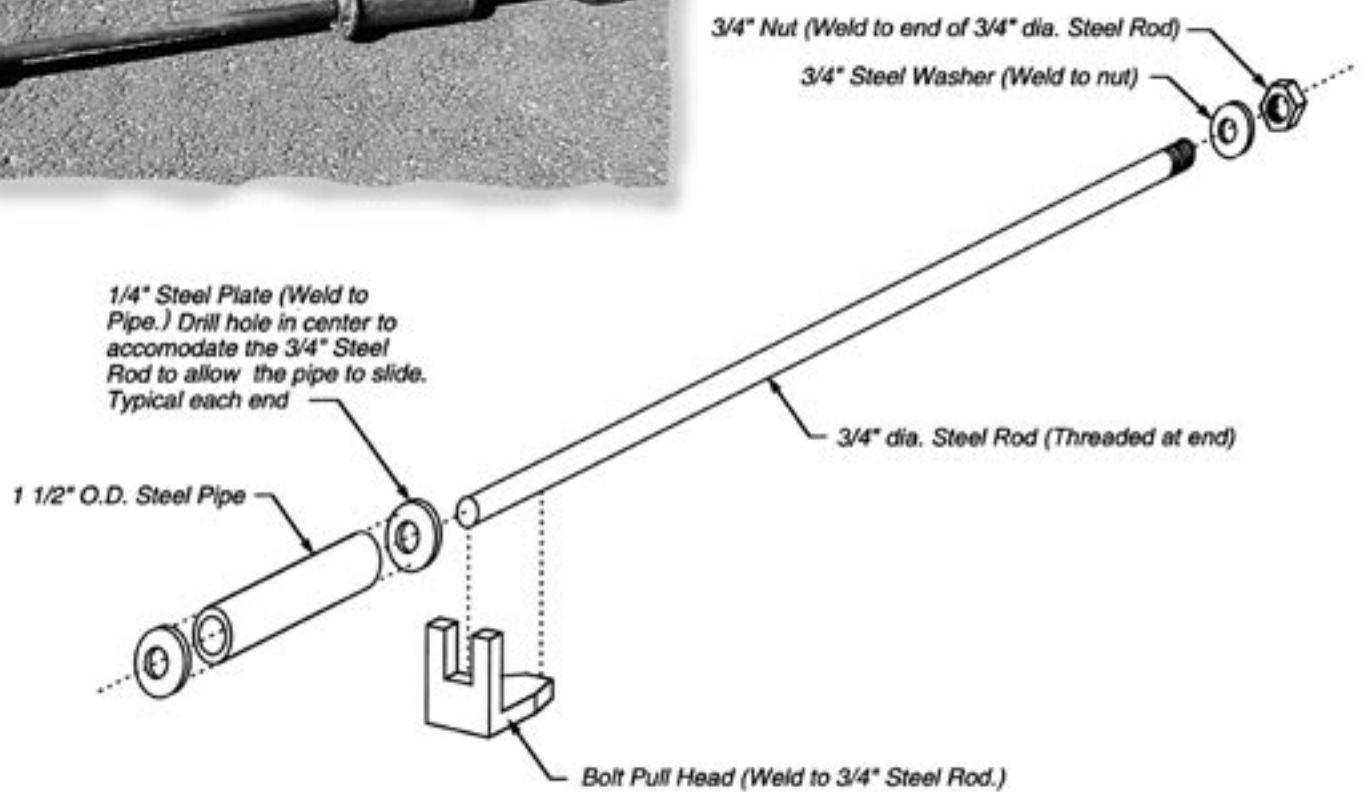
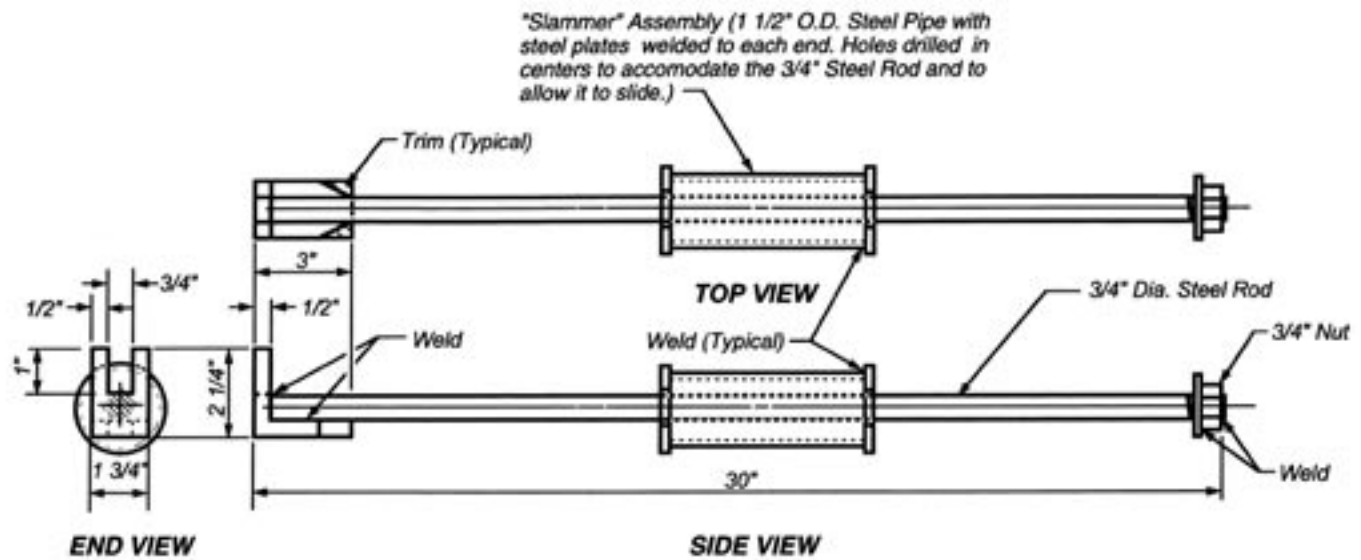
Closeup of Guardrail Bolt Puller



Guardrail Bolt Puller

For more information contact Jim Simmons, WSDOT Kelso Maintenance, at (360) 442-1342.





GUARDRAIL BOLT PULLER

Tim Van Berkom's Asphalt Patching Grader Attachment



Tim Van Berkom stands by his Asphalt Patching Grader Attachment.

By Dave Sorensen, WST2 Traffic Technology Engineer

The Asphalt Patching Grader Attachment, designed by Tim Van Berkom from the WSDOT Shelton Maintenance Office, is used for patching trenches, potholes, and ruts. Two "boots" or blades are attached to a road grader's moldboard blade. The boots are width adjustable for patching and can also be rotated out of the way for full blade width asphalt patching. Tim had help from co-workers Aaron Corliss and Eric Hembury in building this apparatus. The first version was constructed in 1995. Since then the grader blade attachment has changed little in design. The last modifications were done in 1996.

The design of the unit is pretty straightforward. Brackets are bolted on the far left and right

backside of the grader blade. These brackets protrude slightly forward of the blade with round shoes welded to the brackets. Each end of a pipe rests in these shoes. The pipe runs horizontally at full blade width on the top front of the grader blade. The attachment blades have a collar on each one that allows them to slide over the pipe.

Picture a towel rack mounted to a wall in your bathroom with a couple of coat hangers on it that slide left and right on the towel bar, only the bar is about 12 feet wide! That's how the attachment blades are adjusted for width, by sliding them back and forth on the pipe. By using this design, the attachment blades can also be swung up and out of the way of the grader blade if full width patching is desired.

Total cost to build this invention was about \$500 with most of the material obtained from the scrap

pile. The only item purchased was the pipe that the attachment blades slide back and forth on to adjust for patching width.

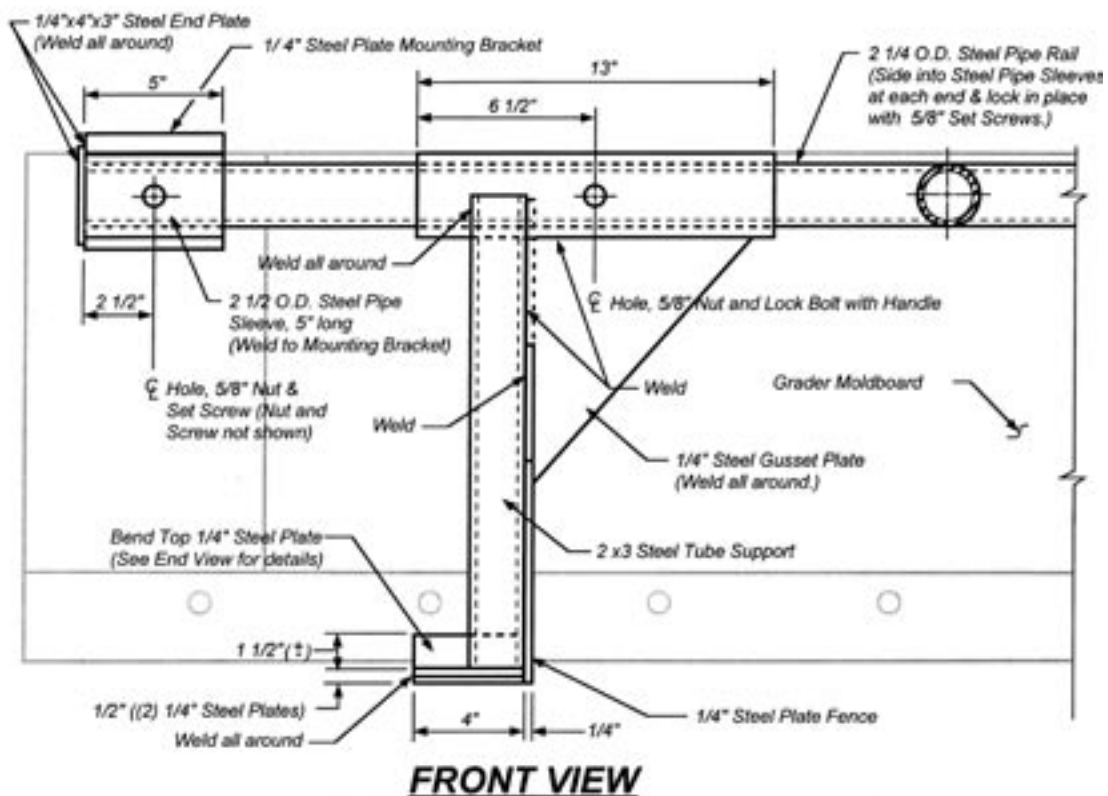
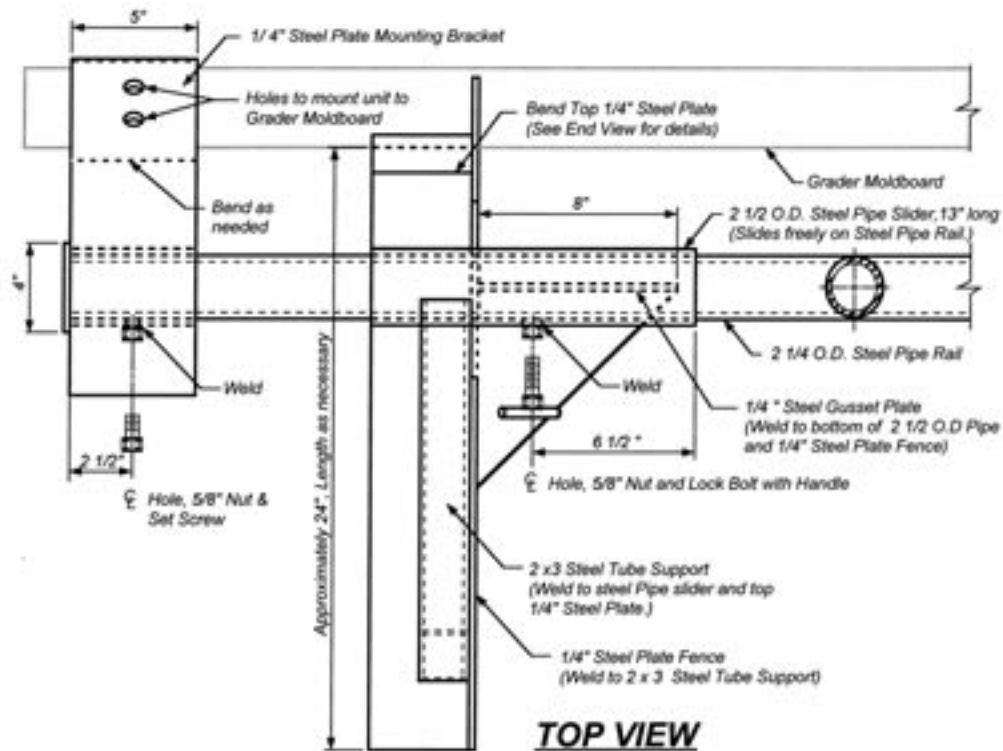
The greatest savings are in reducing the potential for back injuries from raking asphalt all day long. The crew size needed for this type of operation has been reduced from 5 or 6 people to 3 people. Minimal raking and shoveling of asphalt is now required.

Other benefits include smoother patches, lower labor costs, and a more efficient operation. An ACP grinder, rented from the city of Bremerton to prepare potholes, costs about \$700 a day. The old way of doing business meant the crew would spend up to two hours preparing the potholes using the grinder and then filling them with about 40 tons ACP. Using the grader attachment, the grinding operation is three times faster. The attachment saves approximately \$1,400 a day and uses approximately 120 tons of ACP.

"The best thing about this invention is the reduced potential for back injury that could end up being a life-long disability," said Larry Deemer, WSDOT Maintenance Supervisor.



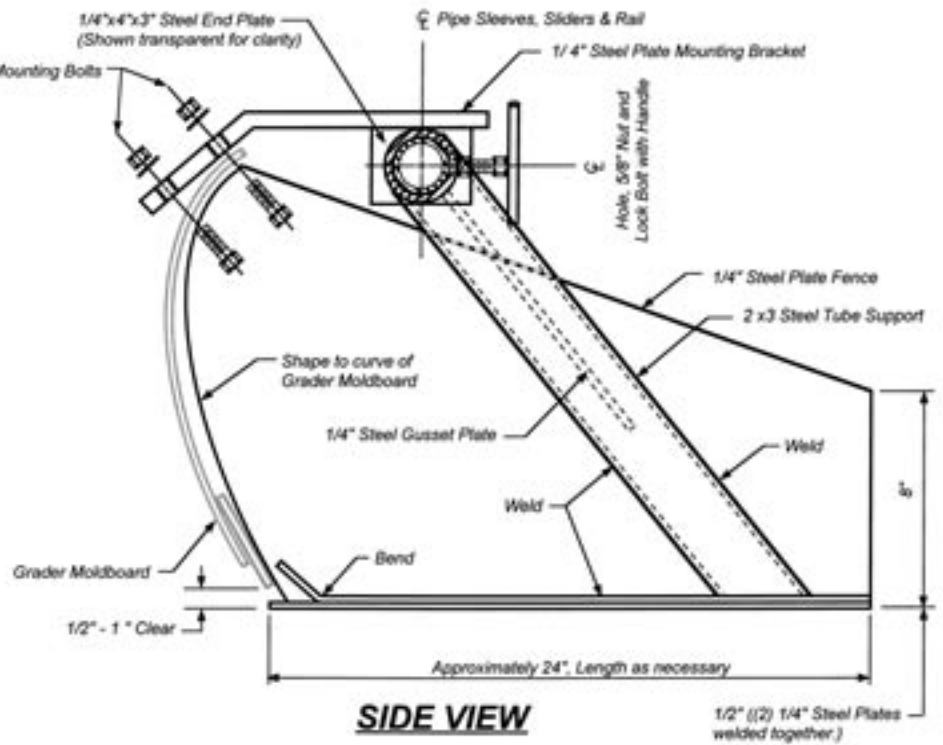
For more information contact Larry Deemer, WSDOT Shelton Maintenance Office, at (360) 427-2110 or ldeemer@wsdot.wa.gov.



NOTE: Right Fence Unit shown. Left Fence Unit similar but reverse hand.



Left "boot" or blade slides out toward the end of the slide rail.



Right "boot" slides out on the rail for a wide patch on a paved road.



The two "boots" are width adjustable for patching.



Right "boot" rotated up and out of the way for unrestricted use of grader's moldboard.

New Feature to the WST2

This is the first installment in the WST2 newsletter from the WSDOT Research Office. We welcome the opportunity to bring you the latest research and resources. The web links included in this article will take you to different research resources. If you want more information about who we are and what we do, go to the WSDOT Research Office Web site at <http://www.wsdot.wa.gov/ppsc/research/default.htm>. Here, you will find updates on current projects, links to reports, information on staff specialties, and more information about our program.

New Research Manager

Leni Oman is the new WSDOT Research Office Manager as of January 1, 2003. Leni comes to us from the WSDOT Environmental Affairs Office, where she was the Planning and Development Manager. Leni replaces Marty Pietz, who retired from WSDOT after 32 years, serving as Research Director for the last 13 years.

Featured Research Projects

WSDOT Research projects that may be useful to local agencies will be featured here periodically. You can check our website to see a current list of projects.

Research Resources

■ Transportation Research Information Services (TRIS) - TRIS Online, <http://ntl.bts.gov/tris>, is an excellent resource for state of the art information on transportation topics. TRIS contains over 535,000 records of published and ongoing research on all modes and disciplines in the transportation field. Last year over 30,000 new records were added to TRIS. At the TRIS search engine, enter key words to get a list of books, reports, articles, and Web sites related to transportation subject areas.

■ Research in Progress (RiP) - The RiP Database contains about 6,600 records of current or recently completed transportation research projects. Each month about 100 new RiP projects are added to the database and another 150 RiP records are updated. The RiP database, on the Web at <http://rip.trb.org/>, is an excellent resource for emerging technologies.

Questions? Problems?

Got a transportation-related work problem that you think should be researched? Need to find a Research Report or other information? Call or e-mail the WSDOT Research Office:

*Washington State Department of
Transportation Office of Research
310 Maple Park Avenue SE
PO Box 47370
Olympia, WA 98504-7370
Telephone: (360) 705-7971
FAX: (360) 705-6911
E-mail: research@wsdot.wa.gov*



2002 Partnership for Excellence in Contract Administration Award Winners

Nine transportation projects received the joint Associated General Contractors and Washington State Department of Transportation's (WSDOT) 2002 Partnership for Excellence in Contract Administration Awards. These awards are designed to recognize and encourage extraordinary achievement by contractor/WSDOT partnerships when delivering transportation projects in a timely, professional, and responsive manner, while also considering the needs of customers and stakeholders who are affected by the project. The projects were categorized by geography, cost and project administration. For more information about the awards program and the winning projects, contact Dave Mariano at (360) 705-7833

Eastern Washington, Projects Over \$2 Million Winners



Left to right: John Conrad, WSDOT; Bob Hilmes, WSDOT; Sean Carpenter, Inland Asphalt Company; Bob Adams, Atkinson Construction Co.; Don Carpenter, Inland Asphalt Company

US 2, Deer Road to Westwood Road Paving
Contractor: Inland Asphalt Company of Spokane, WA
Project Engineer: Bob Hilmes

This project presented a good example of how to keep the motoring public informed of construction activities. The project team set up three variable message signs, which were used to notify the traveling public of upcoming work or location of traffic control impacts. In the commercial area of the project, night paving was required to minimize impacts to businesses. The contractor also worked with the WSDOT to schedule their work in the non-peak direction, reducing the impact on commuter traffic. Another information tool used was a portable highway advisory radio system. A concerted effort was made to keep the advisory message fresh, updating it daily during the week. Two weeks before work began, construction information flyers, with a description of the project, timelines, and contact phone numbers to the project engineer and contractor, were printed and hand-delivered to all businesses and residences that fronted US 2. The project was finished within the specified number of workdays with costs coming in about 5% under budget.

Honorable Mention



A box culvert being constructed on SR 20.

SR 20, Republic to Milepost 312

Contractor: Valley Asphalt and Paving of Colville, WA

Project Engineer: Larry Eik

The primary focus of this project was to minimize impacts to the public by completing the project in one construction season. Included in this pavement-resurfacing job was the replacement of three existing “box” culverts with pre-fabricated bridge structures. The three structures had a tremendous impact to the project schedule. The contractor needed to submit their own designs for these pre-cast units along with developing a construction sequence and traffic control plan that would allow for a minimum of one lane of traffic during construction. To help reduce schedule impacts, the WSDOT Bridge and Structures Office agreed to accelerate their review process. Fieldwork at the site was often underway several weeks before final approvals were received. Even with utilizing this “fast tracking” and working double shifts, it became apparent that the structures would not be completed within the fish window. The project team met with the Department of Fish and Wildlife to explain the problem to them and discuss possible adverse impacts to the environment that might result carrying this project over the winter. After evaluating these factors, the agency granted a two-week extension of the fish window to allow work to continue. With that time extension, the contractor was able to complete the work on all three structures, complete all of the paving, and open the roadway to traffic within the specified working days. Although the work took a few days longer than originally scheduled, the project came in under budget by over \$200,000.

Eastern Washington, Projects Less than \$2 Million Winners



Project Engineer Terry Mattson (center) accepted the “Excellence in Contract Administration” award from John Conrad, WSDOT Deputy Secretary for Engineering and Region Operations (left) and Bob Adams, Atkinson Construction, representing the Associated General Contractors (right).

SR 20, Twisp River Bridge Replacement

Contractor: One Way Construction, Inc. of Sedro Woolley, WA

Project Engineer: Terry Mattson

The Twisp River Bridge Replacement project’s most unique feature was the first use of Supergirder (or deep girder) technology on the Washington State highway system. The original 20-foot wide, 72 year-old bridge had two support piers in the river that affected water flow and fish habitat and required regular maintenance. The nearly 200 foot long Supergirders eliminated the need for support piers in the river for the new 40-foot wide span. As with any new technology, there were challenges. Timing, bridge clearances, weight limits, and even turning diameters had to be analyzed to determine the transporting route of the bridge girders. Completing the work in stages to allow the least disruption to the community presented challenges with the short construction season and even shorter fish window. Half of the new span was constructed adjacent to the existing structure and traffic was shifted onto it during demolition of the old bridge. The second half of the new bridge was constructed and the two halves were joined, which was the only 24-hour period during construction when traffic was completely restricted. Public meetings, regular contact with city officials and weekly radio and newspaper updates were successful in involving the public in the project and informing them about the day-to-day traffic impacts and progress of the work. The project was constructed within budget (\$1.9 million), on time (250 working days over three construction seasons) and with a high degree of public involvement and approval.

Honorable Mention



SR 153, Carlton Bridge

SR 153, Carlton Bridge Repair

Contractor: F.E. Ward, Inc. of Vancouver, WA

Project Engineer: Kirk Berg and Bob Romine

The concrete girder T-beam bridge, built in 1935, had a section of the sidewalk and railing collapse on February 26, 2002, forcing the 438-foot span to be closed. The project repaired broken sidewalk, replaced railing, and paved the bridge over the Methow River at Carlton on SR 153 between Pateros (on US 97) and Twisp (on SR 20) in Okanogan County. The contract was completed for \$491,191, well under the original bid amount of \$532,459. A major repair contract for the bridge was scheduled to be put out for contractor bids on April 1 with an early summer start. As a result of the February sidewalk failure, WSDOT called for an emergency declaration to allow the work to be accelerated. Fisheries and environmental agencies approved the emergency declaration and work began March 4 and finished on July 3. Eighty calendar days were scheduled for the project. The contractor not only completed the work in 77 days, but scheduled crews to work an extra day most weeks to complete the work within the "fish window" time frame of the emergency permit and to accommodate the desires of Methow Valley communities that wanted the work finished before the tourist-busy 4th of July holiday.

Western Washington, Projects Over \$2 Million Winners



Left to right: John Conrad, WSDOT; Greg Waugh, Max J. Kuney Co.; Pat McCormick, WSDOT; Bob Adams, Atkinson Construction Co.

SR 525/SR 99 Interchange

Contractor: Max J. Kuney of Spokane, WA

Project Engineer: Pat McCormick

This project replaced two existing offset intersections between SR 525 and SR 99 with a new partial cloverleaf interchange. A grade separated interchange was constructed featuring a precast girder bridge and five new interchange ramps. An aggressive construction schedule provided for the early opening of the bridge and roadway. This aggressive schedule required extensive coordination with utility relocations, independent utility contractors, and the successful resolution of disputes. Coordination for the removal of hazardous waste and underground storage tanks from five areas and the demolition of twenty building/structures was necessary to meet this schedule.

Honorable Mention



Looking north at the SR 99 Spokane St. Bridge

SR 99 Spokane Street Bridge Retrofit

Contractor: Mowat Construction Company

Project Engineer: Brian Nielsen

The project installed steel jackets around 83 existing concrete columns to help the bridge better withstand earthquakes. The final contract amount is estimated to be \$2.56 million dollars, including a \$357,000 change order to repair major damage as a result of the February 2001 Nisqually Earthquake. Mowat Construction completed all work nearly two months ahead of the contract schedule. The project was cited for the high level of cooperation among the project office, Mowat Construction, and staff at the Bridge and Construction offices at WSDOT Headquarters in Olympia. The team overcame a variety of challenges, including determining the total damage and scope of repairs needed to address the affects of the Nisqually Earthquake. In addition, crews had to complete the work in a confined area of an urban industrial neighborhood while working around three different working railroad spurs. The contract also required keeping adjacent businesses in full operation while work was under way. Through proactive communication with the businesses in the project area, Mowat Construction was able to complete the work with minimal disruption and in fact received letters of commendation from three of those businesses.

Western Washington, Project Less than \$2 Million Winner



Left to right: John Conrad, WSDOT; Ron Pollock, WSDOT; Pat McSorely, Concrete Barrier, Inc.; Bob Adams, Atkinson Construction Co.

Emergency I-5 Railroad Bridge Repairs After Earthquake

Contractor: Concrete Barrier, Inc. of Mukilteo, WA

Project Engineer: Ron Pollock

The Nisqually earthquake structurally damaged the I-5 railroad bridge, which crosses over the Burlington Northern Santa Fe (BNSF) railroad tracks near Exit 77 (State Route 6) in Chehalis and was originally built in 1954. In addition to permanently fixing the damaged areas, the contract required that the bridge be updated to meet current earthquake safety standards. The project was completed on March 22, 2002 at a cost of only \$312,812. The location of the bridge presented some unique challenges to WSDOT and the contractor when the project started construction. Due to the high volumes of traffic on this particular stretch of I-5, all construction had to take place at night during an unpredictable and often icy winter season. In order to conduct the bridge repairs, each of the 11 support columns had to be jacked up simultaneously. No traffic could be allowed on the bridge during this part of the repairs, so a series of eight "rolling slowdowns" were conducted. The rolling slowdowns, where pilot cars guide traffic slowly through the work zone at intervals, allowed the necessary repair work to take place without forcing the contractor to completely shut down I-5 for long periods of time. Throughout the bridge repair project, WSDOT and Concrete Barrier Inc. also made a concerted effort to keep the media, public, Washington State Patrol, Lewis County officials, and the Washington Trucking Association informed of all closures and slowdowns. This enabled motorists to find alternate routes around the bridge if they chose, which helped reduce traffic levels on the bridge during key construction activities.

Special Mention, Other Projects Administered by WSDOT



Left to right: John Conrad, WSDOT; Greg Waugh, Max J. Kuney Company; Amy Revis, WSDOT; Karsten Olsen, Max J. Kuney Company; Bob Adams, Atkinson Construction Co.

SR 500 Thurston Way Interchange

Contractor: Max J. Kuney Company of Spokane, WA

Project Engineer: Amy Revis

The SR 500/Thurston Way interchange project, which was completed in October 2002, was the state's first transportation design-build project that served as a pilot project for a process new to both WSDOT and the contractor. As a design-build project, the Max J. Kuney Company designed and constructed the entire project. Normally, WSDOT does the planning and design work and the contractors only do construction. This innovative approach allowed the construction schedule to be compressed by one full year, which helped minimize traffic impacts at this highly commercial intersection. The SR 500/Thurston Way intersection is one of the busiest in southwest Washington and has some of the highest non-interstate traffic volumes in Clark County. Keeping traffic moving during construction and maintaining access to the local businesses presented one of the project's biggest challenges. After consulting with local businesses and emergency services representatives, full weekend closures were used as opposed to multiple days of single lane closures and flagging, which would have disrupted traffic for a longer period of time. To help communicate with area residents, business owners and their customers, multiple public meetings and meetings with business owners were held prior to and during construction, and a variety of public information tools were utilized by WSDOT and Kuney throughout the project, including newsletters, fliers, press releases, web pages, brochures, signs, and a 24-hour project hotline.

Honorable Mention



Chihuly Bridge of Glass

705 Pedestrian Overpass

Contractor: Kiewitt Pacific Company

Project Engineer: Michelle Britton

The I-705 Pedestrian Overpass project constructed a 500-foot-long pedestrian bridge linking downtown Tacoma, WA to the city's waterfront. Dividing these two locations was one parking lot, five lanes of interstate, one interstate ramp, three railroad tracks and one city street, all side-by-side. Attached to the top of the bridge for pedestrian enjoyment was glass-blown art from Chihuly Studios. Attached under the bridge was a new waterline for anticipated future development. The bridge itself was constructed of steel girders on concrete piers above shaft footings.

One of the unique aspects of this project that made contract administration a real challenge was the crucial role of the contract work schedule. Not only was the contractor's schedule used to monitor and adjust critical path work to ensure an opening day of July 5, 2002, but it was critical in identifying and coordinating activities to the liking of numerous stakeholders. Once the schedule was adjusted to meet the needs of the stakeholders, it was imperative that the teams work together to keep to the committed schedule. Each additional modification to the schedule would require significant coordination by the team, affected stakeholders, and the owner.



SR 20/South March Point Road Intersection Project Success



By Dave Crisman, Acting Project Engineer, WSDOT Mt. Vernon Project Engineer's Office

Washington State Department of Transportation (WSDOT) Mount Baker Region is administering a \$1.4 million project for the Swinomish Tribe to build an access road. The project consists of constructing approximately a half-mile of new roadway under the Swinomish Slough Bridges, connecting South March Point Road with Padilla Heights Road, and eliminating the at-grade intersection of SR 20/ March Point Road.

This project has eliminated a dangerous intersection near the Swinomish Tribe's Northern Lights Casino that has been the site of two fatal collisions and a third serious vehicular accident just this past year.

The project, eight years in the making, is the result of a joint effort involving the Swinomish Tribe, the Federal Highway Administration, the U. S. Bureau of Indian Affairs, WSDOT, the State Transportation Improvement Board, Skagit County, and the city of Anacortes.

This project has eliminated a dangerous intersection near the Swinomish Tribe's Northern Lights Casino that has been the site of two fatal collisions and a third serious vehicular accident just this past year.

Ground was broken for the new access road on October 15, 2002, complete with an Indian blessing ceremony. Expectations were that the underpass would open in the spring of 2003, when in fact it took only two and a half months for the WSDOT and the Prime Contractor, Callen Construction, to complete the new SR 20 under-crossing. The successful early completion was due in part to excellent

cooperation between all parties and an unusually dry fall. The good weather allowed the contractor to use a high amount of native material and to work through what is usually a wet time of the year.

Swinomish Tribal Chairman Brian Cladoosby was pleased with the outcome. He stated, "We are thrilled that our dream of enhancing the safety of this intersection is finally coming to a successful end. All the players, including Callen Construction, worked so well together that this project has been completed on time and under budget."

The contract is presently under suspension, but open to the public, while waiting for the final lift of asphalt this coming spring. ▲

Photo top left: This completed access road carries traffic to and from the Swinomish Northern Lights Casino under the Duane Berentson Bridge on Highway 20, east of Anacortes. The twin bridges can be seen in the background of this photo.

Photo top right: This nearly completed roundabout is part of the new access road and has two legs available for future development along the Swinomish Slough.

The Riverside Bridge Project: Partners Working Together



The new Riverside Bridge super-girders are in place as the structure is nearing completion. A DOT inspector is monitoring in-water vibrations on the temporary work trestle.

By Mark Hammer, Assistant Project Engineer, WSDOT Mount Vernon Project Office

Washington State Department of Transportation (WSDOT) Mount Baker Region is administering a \$23 million project for the city of Mount Vernon to replace the existing Riverside Bridge over the Skagit River. Among other activities, the project includes:

- Grading
- Constructing a storm sewer system with pump station.

- Removing the existing Skagit River bridge and constructing two new bridges, one over the Skagit River and the other over Hoag and Stewart Roads.

- Constructing a curb, gutter, and side.
- Traffic signals and illumination.

The existing two-lane truss bridge was constructed in 1934. The structure does not meet current earthquake safety standards and, due to the age of the structure, routine maintenance has become costly and extensive. Even if the

bridge could be brought to current safety standards, the community would be left with a narrow bridge that is inadequate for present and future traffic volumes.

The project, twelve years in the making, is the result of a joint effort involving:

- The cities of Mount Vernon and Burlington
- The Federal Highway Administration
- The National Marine Fisheries Service
- Both the U.S. and Washington State Fish and Wildlife Service
- The National Oceanic and Atmospheric Administration
- The Coast Guard
- U.S. Army CORPS of Engineers
- WSDOT
- The Washington State Department of Ecology
- Dike Districts #12 and #17
- Kiewit Pacific Company, the prime contractor from Vancouver, WA

Ground was broken for this project in May 2001. Expectations are that the new Riverside Bridge will open in June 2003, and the project will be completed by December 2003. One reason this project is on-track to



This aerial view, looking westerly, shows the old Skagit River truss bridge and the Contractor's work trestle (foreground) as construction progresses on the drilled-shaft foundation of the new bridge.

meet the planned completion date is the cooperation of the permitting agencies to allow extensions of the in-water work period. The federal, state, and local agency permits only allow work "in-water" between July 1 and October 31 each year. With assistance from the permitting agencies and their work with the City and Contractor, this work "window" was extended to allow more time for the Contractor to perform project activities.

Constructing the new bridge will enhance economic opportunities in the area by improving pedestrian,

bicycle, and vehicular access and reducing congestion. The new Riverside Bridge will carry four traffic lanes, two bicycle lanes, and sidewalks. Since this new bridge will be higher than the old one, there will be increased vertical clearance under the bridge for both Whitmarsh Road traffic and water vessel traffic. Improved water quality will also be achieved with the removal of the creosote timber piling located in the river to protect the draw-span of the old bridge.



Unique Public-Private Partnership Helps Reduce Commute Trips and Emissions

By Barbara Davis, Communications and Public Involvement Manager, WSDOT Public Transportation and Commute Options Office

A public-private partnership in King County is reducing commute trips and emissions thanks to a unique approach to distributing federal Congestion Mitigation and Air Quality (CMAQ) Improvement Program funds. The partners include private employers, King County, Washington State Department of Transportation (WSDOT), and Commuter Challenge, a non-profit organization that works closely with businesses to help them implement the state's Commute Trip Reduction (CTR) law. Commuter Challenge is affiliated with the Economic Development Council of Seattle and King County.

These organizations have collaborated to invest \$1.1 million dollars in CMAQ funds at the worksite level in 2001-2002. This was accomplished through a series of competitive grants to employers, \$5,000-30,000 each, designed to increase participation in trip reduction. For both rounds of grants, employers must provide a match and commit to continuing the project.

In 2001 CMAQ funding came through WSDOT. WSDOT in turn contracted with Commuter Challenge to award the grants and manage the contracts. In 2002 CMAQ funding came through King County. Again, Commuter Challenge has managed the

Examples of projects funded by the 2001 grants include showers, bike lockers, and memberships in Flexcar, the Seattle-based car-sharing company.

process; however, WSDOT and King County continue to be closely involved in implementation.

Examples of projects funded by the 2001 grants include showers, bike lockers, and memberships in Flexcar, the Seattle-based car-sharing company. One employer, Berger/Abam in Federal Way, purchased a hybrid-fuel vehicle for its employees to use for errands if they use a commute option to get to work. The grant provided about half of the money for the \$23,000 hybrid; Berger/Abam paid the remainder as well as ongoing costs for insurance, maintenance, and gas. The 2002 grants include a number of leased VanShare vans for low-mileage trips connecting work sites to Sounder stations.

Each project will be held accountable through its contract. Results will also be reflected in the annual employer surveys for

the CTR program. Washington State will be evaluated on its performance with the CMAQ funds by the number of trips reduced and emissions prevented.

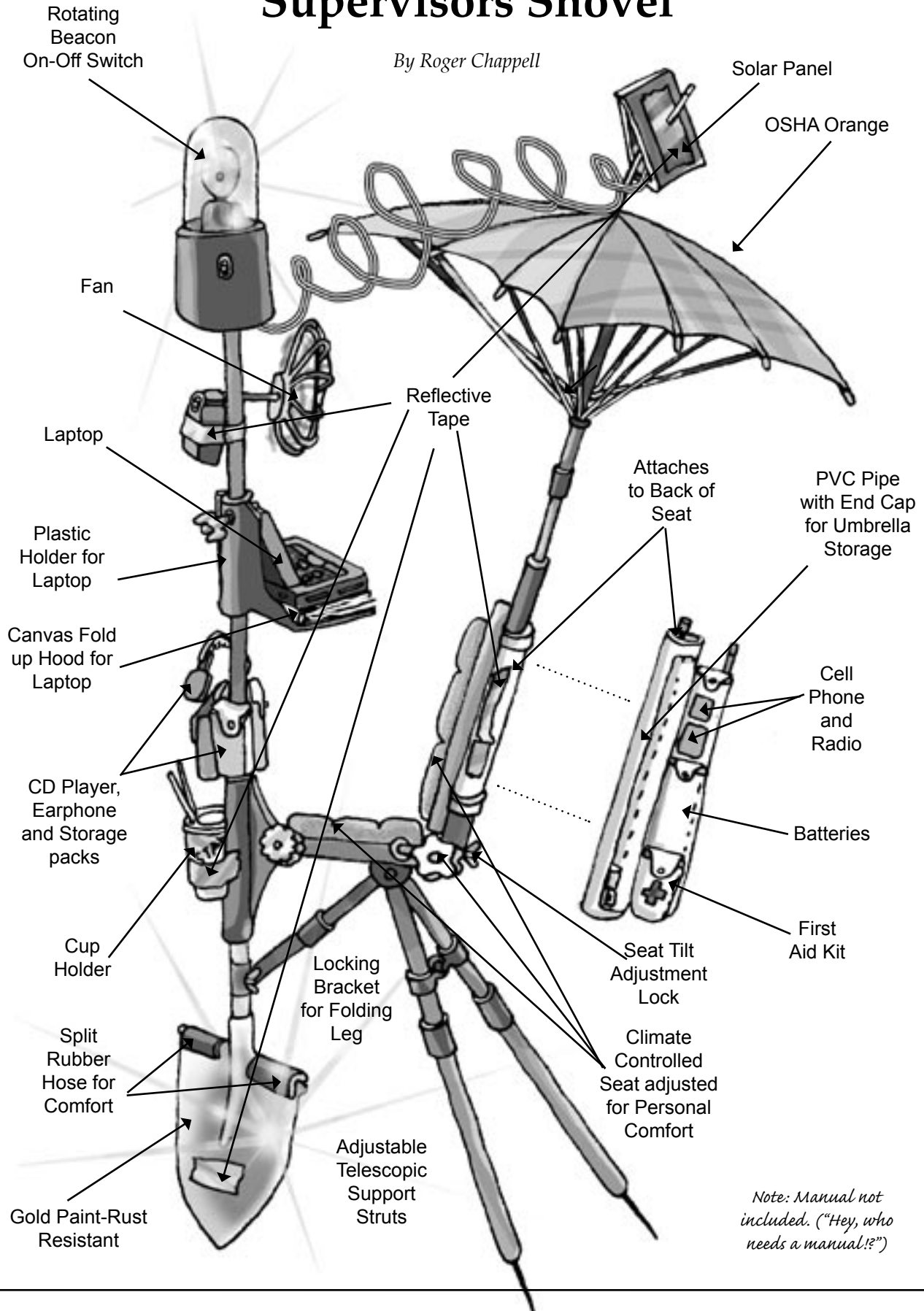
This grants' process is characteristic of CTR in Washington State: the program emphasizes flexibility in developing solutions and reliance on its extensive network of formal and informal partnerships to help craft solutions. However, the strategy of using the CTR network to put CMAQ funds to work at the worksite level and immediately leveraging the investment is unique to Washington State. The city of Santa Barbara, California has already expressed interest in using the WSDOT/King County efforts as a model for distributing future CMAQ funds.



For more information, contact T. J. Johnson, WSDOT's Trip Reduction Administrator, at johnstj@wsdot.wa.gov or (360) 705-7508. Project descriptions are available at <http://www.commuterchallenge.org/>.

Supervisors Shovel

By Roger Chappell





*By John Carpita, P.E., MRSC
Public Works Consultant*

Introduction to MRSC

The Municipal Research & Services Center (MRSC) is a non-profit, independent organization created in 1969 to continue programs established in 1934 under the Bureau of Governmental Research at the University of Washington. Our mission is "working together for excellence in local government through professional consultation, research and information services."

Services are provided in five main areas: Inquiries ('help desk'), Library, Web Site, Publications and Training. MRSC serves local government by providing:

- Dependable, professional advice about local government issues.
- Quick access to legal and policy research.
- Practical solutions that work.
- Sample documents: policies, ordinances, plans, budgets, etc.
- Timely and informative publications and guidebooks.

A New Section to the WST2



- Largest and best local government library in the state.
- 24-hour access to MRSC resources on the Web.
- Research service that save time and money.

MRSC primarily serve Washington State city and county governments, although much of what we do is applicable to other municipal governments as well. Individual cities and counties pay no fees for the Center's programs. Instead, programs are cooperatively funded out of a small portion of the cities' distributions of the Liquor Board profits and the counties' distribution of the Liquor Excise tax. Funding is provided through a biennial contract with the Municipal Research Council, a state agency.

Future MRSC Articles

Over the next several issues of the WST2 newsletter, I'll be sharing information regarding public works contracting for local governments in Washington State. This information will be based on the traditional design-build-bid

model, as most local governments in Washington are still required to use this model. Along with a "Rock and Roll Moments" question and answer section, future articles will include:

- Selection, Care and Feeding of Your Design Consultant (see next page)
- An Ounce of Prevention Kills Two Birds with One Stone
- Got Them Old Bidding and Bonding Blues?
- Are We Having Fun Yet? (Contract Administration)
- No Job is Done Until the Paper Sticks to Your Shoe

Your feedback is essential, as I can more readily provide the kind of information you need if you tell me. You can contact me at

(206) 625-1300 or at
jcarpita@mrsc.org.



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MRSC Web site: <http://www.mrsc.org/>*

Selection, Care and Feeding of Your Design Consultant



By John Carpita, MRSC Public Works Consultant

Selection of professional consultants (architects, landscape architects, engineers and land surveyors) always seems to be more difficult than it should be. There's this pesky Washington State statute (Chapter 39.80 RCW) that requires a strange thing called quality based selection (QBS). Local government agencies can't just bid these contracts the way they do construction contracts and get the lowest bidder. They also can't just hire a professional consultant without complying with one of the

two statutory means of notifying prospective consultants. In addition, all agencies ask themselves at one time or another: "Do we really need those blinkety-blank consultant rosters?" and "Do we really need these 'dog and pony show interviews' that consultants hate as much as we do?" Many agencies also assume that once they have a contract with an A/E (architectural and engineering) firm, they can coast until the firm delivers its report or contract document sets.

This article is intended as an introduction to A/E consultant selection, contract negotiation and management and to identify additional training and Web site resources available.

First of all, what do the statutes say?

■ Chapter 39.80 RCW requires selection of professional architecture, engineering, surveying and landscape architecture services on the basis of qualifications of the firm or individual.

■ AGO (Attorney General's Office) 1988 No. 4 notes:

A public agency may not, in procuring architectural or engineering services, consider proposed price or cost in determining which firm is most highly qualified to provide services.

When a public agency selects a firm to perform architectural or engineering services, price and cost may be considered only after the most qualified firm has been selected, at which time the law provides for negotiation of a "fair and reasonable" price.

RCW 39.80.030 also requires advance publication of an agency's requirement for professional services. Two methods of compliance are noted; either one can be used:

■ An announcement for each project.

■ A general announcement of projected requirements for any category or type of professional services. [Normally referred to as a Consultant Roster.]



[NOTE: Funding agencies, notably federal agencies and some state agencies that administer federal funds, may have additional requirements. For example, the Local Agency Guidelines, Chapter 31, states that non-Certification Acceptance (CA) agencies must submit proposed consultant agreements to the Washington State Department of Transportation (WSDOT) Regional Local Programs Engineer for approval prior to execution.]

Goals of consultant selection procedures are:

- To obtain the best professional services at a reasonable cost.
- To establish an open, documented procedure for selection of professional services.
- To avoid potential conflicts of interest or the appearance of favoritism in the selection.
- To permit all qualified professionals to have an opportunity to be considered, as much as practical.

Selection Procedures

Depending on the projected cost and perceived complexity of a project, an agency may use either a formal or informal selection process when contracting for professional services. Statutes do not set a dollar limit above which a formal selection process is required, so each agency is free to adopt its own policies. Informal selection implies that for smaller and less complex projects, the agency may request proposals from qualified firms listed on its consultant roster, or the agency may simply choose a qualified firm directly from the roster.

Formal selection procedures can include all of the following steps:

- Develop a Request for Qualifications (RFQ).
- Advertise for RFQs.
- Evaluate RFQs received.

- Select qualified firms for 'Short List'.
- Send Request for Proposals (RFP) to firms on 'Short List'.
- Interview firms who respond to the RFP.
- Select most qualified finalist.
- Identify scope of work, tasks and milestones.
- Estimate person-hours required for each task.
- Select compensation method(s).
- Negotiate contract with finalist.
- Write contract and secure necessary reviews and approvals.
- Administer contract.
- Verify quality of consultant deliverables.
- Evaluate consultant's performance.

Resources

- MRSC Website - Design Using Consultants - <http://www.mrsc.org/Subjects/PubWorks/construct/conman2.aspx>
- Contracting for Professional Services in Washington State. Municipal Research and Services Center of Washington, Information Bulletin No. 485, April 1994. [F 8.8000 C676 1994]
- Selection and Use of Engineers, Architects and Professional Consultants: Guidelines for Public Agencies. Second Edition James L. Martin, American Public Works Association, 1997. [G 9.5100 S45 1997]



Care and Feeding of Your Consultant

So, you've successfully negotiated the contract at a fair price to both the consultant and your agency, and the contracts are signed (in triplicate no less), sealed and delivered. There's nothing to do now but wait until the consultant brings his 50 sets of contract documents into your office in about 120 calendar days. Now you can sit back and enjoy that double mocha. Life is good.

Wake up and smell the mocha!

Monitoring contract performance is more than simply reviewing the consultant's monthly status reports and processing progress payments. Get involved! After all, it is your project that the consultant is working on.

Monthly status reports are essential, but you should verify for yourself that the tasks/products are in fact completed to the degree shown in the reports. Visit the consultant's office almost as often as they come to visit you, and get to know the designers and technicians working on the project almost as well as you will know the project manager.

It is important to practice partnering and become an Agency-Consultant team. Develop camaraderie, but always buy your own lunch.

Be reasonably available for consultant contacts. If you're on vacation, provide backups. Return telephone calls promptly; don't assert your power by making consultants wait. The consultant



Monthly status reports are essential, but you should verify for yourself that the tasks/products are in fact completed to the degree shown in the reports.

contract is a team effort, after all.

Provide any material that the City/County is to furnish sooner than expected under the contract. Review interim submittals as promptly as you can. If others in your agency or within your unit of local government must also review submittals, try a joint review meeting for all concerned. If that

doesn't work, be politely tenacious in getting their comments. Also, be the first to know about any performance problems or potential delays. Let the consultant know immediately that such problems or delays are unacceptable if they are, in fact, the consultant's fault. Be firm but fair.

Public hearings and other information gathering meetings should be truly a joint effort between City/County staff and the consultant. Maximize the consultant's presentation skills while leaving an overall impression that the agency itself is in full control of the project.

Also remember:

- Keep your supervisors and elected officials informed as to progress or the lack thereof and any contract issues that they may have to take action on well before the drop dead date for such actions.
- As much as is practical, arrange for timely payment of monthly progress payments.
- Celebrate completion of the contract with appropriate kudos.
- Evaluate the consultant's performance.



Rock and Roll Moments

1Question: Britney Spares, Smalltown's Public Works Director, needs to hire an engineer to design a \$10,000 sewer project, with an estimated fee of \$1,000. The Town doesn't have a consultant. Besides telling her to 'put some clothes on, girl,' how would you advise her to proceed?

1Answer: Theoretically, the Town would need to advertise, at least once in the Town's official newspaper, its need for the design services and then choose the most qualified firm or person to perform the work from those responding. There is probably no need for a formal selection committee or interviews.

2Question: Bingo Star, your Public Works Director (PWD), chooses a consultant to design a \$2M county roadway project by simply going through the consultant roster files, choosing three firms for further consideration and sending an RFP (request for proposal) to the number one firm (in his estimation) on that list. Has he violated State statutes?

2Answer: No. The city has used one of the two methods prescribed by RCW 39.80.030 by "... (2) announcing generally to the public its projected requirements for any category or type of professional services" via the consultant roster. He then selected, "based upon criteria established by the agency, the firm deemed to be the most highly qualified to provide the services required for the proposed project." However, this process is not necessarily a good idea, as it leaves the PWD open to claims of favoritism and may not be sanctioned by funding agencies.



THE MANUAL ON UNIFORM Pavement Marking Information

For roadway pavement marking engineers and managers, the following website contains information of pavement marking materials used in some states and Federal Lands. <http://www.washto-x.org/synopsis/8-13-2002.pdf>



Words from the Chair

In the last issue I gave an analogy to illustrate some of the challenges facing local agency pavement managers. As I've said, the NorthWest Pavement Management Association (NWPMA) seeks to provide opportunities for networking and information transfer. So, how did the NWPMA come into being? Having had the privilege of being around this business for a few years, I will try to provide my perspective on the evolution of the organization.

I would trace the origins of the NWPMA to Washington in the mid 1960s and to the collection of pavement data to support decisions made conforming to the priority programming law. During the 1970s and early 1980s, the Washington State Department of Transportation (WSDOT) developed a Pavement Management System for State Highways. This history is well documented in the February 1983 report WA-RD 50.1 entitled "Development and Implementation of Washington State's Pavement Management System." Local agencies entered the picture in 1983-84 with the research report WA-RD 62.1 entitled "Feasibility Study of a Pavement Management System for Washington Counties."

*In the mid 1980s
the development and
commercial success
of the IBM personal
computer opened
up the possibility
of pavement
management systems
operating in a desktop
environment.*

The report documented work to "... evaluate the feasibility of adopting the Washington State Pavement Management System (WSPMS) for the needs of Washington counties." The report concluded that "the state mainframe computer system [had] adequate storage capacity to support usage.... by a large number of counties. Dial-up capability is available for use of WSPMS from remote terminals." The report also recommended a trial demonstration using two counties:

one large with in-house computer facilities and one small with no or minimal facilities. Research report WA-RD-79.1 entitled "Pavement Management System: Demonstration for Washington Counties" documented the work to modify the state mainframe program for use by Washington counties. This program was called the Washington County Pavement Management System (WCPMS). Thurston and Benton Counties participated in the trial.

Prior to 1985, I believe that all pavement management systems were programmed to run on mainframe computers.

In the mid 1980s the development and commercial success of the IBM personal computer opened up the possibility of pavement management systems operating in a desktop environment. Local agencies in Washington saw the possibilities for using personal computers in a number of areas, including pavement management. In 1985 and 1986, a project began to convert the WCPMS to a desktop environment. I believe it was also the first time that Washington cities became actively involved in pavement management work in

cooperation with WSDOT. This work is documented in research report WA-RD 108.1 entitled Microcomputer Conversion of Washington State Pavement Management System for Cities and Counties. Many of us are familiar with the program WSC2PMS, and I surmise that the acronym stood for Washington State City and County Pavement Management System. The capability of having the data developed and the analysis run within the agency led to widespread interest from both cities and counties. This interest also led to two needs: a need for computer support in operating the program and a need in technical support for the emerging discipline of local agency pavement management.

One supporting resource available to Washington counties was the County Road Administration Board. Cities found themselves lacking an organized support structure for WSC2PMS and pavement management in general. In the late 1980s several cities in the Puget Sound area began meeting and formed the NorthWest Pavement Management System Users' Group. The group developed an organization charter and met on a monthly and then semi-monthly basis. Meetings were hosted by local agencies and included technical speakers and provided an opportunity for networking.

In the meantime, several Washington counties were exploring the use of deflection testing equipment for routine evaluation of county arterial roads. Several counties purchased the Road Rater, a deflection-testing device. Interest in this led to the first Road Rater Users' Conference hosted by Clark County in the fall of 1989. The conference was an immediate success and became

Interestingly enough, both the NorthWest Pavement Management System Users' Group and the Road Rater Users' Group began to expand the scope of the topics they covered and attendance at the meetings of both groups included city and county personnel.

an annual event. In addition, the group added an informal spring conference.

Interestingly enough, both the NorthWest Pavement Management System Users' Group and the Road Rater Users' Group began to expand the scope of the topics they covered and attendance at the meetings of both groups included city and county personnel. After a few years, because the needs and objectives of both groups were similar, an effort was made to combine the groups. Meetings were held for over a year and resulted in the formation of the NorthWest Pavement Management Association.

Over the years technology has improved, software has been refined, and local agencies have sought ways to manage their pavements effectively. The basic need for networking and support remain. NWPMA is a unique

organization because it was created and is operated by local agencies. I believe it is important that local agency pavement managers realize the level of effort that has gone into making the organization what it is today. There is a continuing need for others to become involved to keep the organization healthy and responsive to the needs of its members.

In this issue, I have tried to focus on the development of the NWPMA in Washington. As you know, the organization charter was amended several years ago to include Oregon and Idaho. In the next issue, with the help of our Oregon and Idaho partners, I plan to provide background into the development of local agency pavement management in those states.

Again, as always, your comments are welcomed. Please e-mail me at bill.whitcomb@ci.vancouver.wa.us.

Bill Whitcomb

Bill Whitcomb
Chairman, NWPMA
City of Vancouver, Washington



Meet the Federal Highway Administration's Washington Division Staff in Olympia

*By Daniel M. Mathis, FHWA
Washington Division Administrator*

Thanks to the WST2 newsletter for allowing me to introduce the Federal Highway Administration (FHWA), Washington Division to state and local transportation professionals.

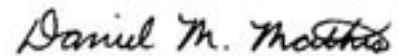
The FHWA Washington Division is located in downtown Olympia. The role of the Division Office is to work in partnership with WSDOT and local agencies to improve Washington's highway system. This is accomplished through our assistance in delivering the \$480 million annual federal-aid highway program. The funds are used for

improving state, county, and city highways, roads, and streets.

In delivering the federal-aid program, we work closely with our partners to develop and implement new technology and advance Washington's infrastructure. As a result, we are an excellent source of information on a wide range of highway and transportation related subjects. We have four teams covering program areas such as financing, transportation policy, civil rights, bridge, safety, environment, planning, research, technology transfer, right-of-way, traffic operations, and pavements.

Out office information can be found on our Web site at <http://www.fhwa.dot.gov/wadiv/> and our office phone number is (360) 753-9480. As always, we are looking forward to working with you.

Sincerely,



Daniel M. Mathis
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Manager*



Sid Stecker
Transportation Planner



Paul Harker, P.E.
Traffic/Safety Engineer

Guidance on Traffic Control Devices at Highway-Rail Grade Crossings

*By Liana Liu, P.E. Traffic/Safety/T2
Engineer and LTAP Coordinator,
FHWA Washington Division*

The FHWA has issued guidance to assist engineers in selection of traffic control devices or other measures at highway-rail crossings. The report, "Guidance on Traffic Control Devices at Highway-Rail Grade Crossings" is available at the following URL: <http://safety.fhwa.dot.gov/media/twgreport.htm>. This guidance is designed to assist in decisions to install traffic control devices or otherwise improve highway-rail grade crossings.

The guidance is not to be interpreted as policy or standards. Any requirements that may be noted in this guidance are taken from the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). The goal is to provide a document for users to understand general engineering and operational concepts of highway-rail grade crossings and provide guidance in the selection of traffic control devices or other measures at highway-rail grade crossings. The guidance discusses a number of existing laws, regulations and policies of FHWA and the Federal Railroad

Administration (FRA) concerning highway-rail grade crossings and railroad operations, driver needs concerning various sight distances, and highway and rail system operational requirements and functional classification. It includes a description of passive and active traffic control devices, including supplemental devices used in conjunction with active controls. An appendix provides limited discussion on the topic of interconnection and preemption of traffic signals near highway-rail grade crossings.

There is also discussion concerning crossing closure, grade separation, and consideration for installing new grade crossings. Finally, a glossary defines the technical terms.



For further information contact Mr. Robert Winans, Office of Safety Design (HSA-10), at (202) 366-4656 or Mr. Raymond Cuprill, Office of the Chief Counsel (HCC-30), at (202) 366-0791.

Official Rulings Database

*By Liana Liu, P.E. Traffic/Safety/
T2 Engineer, FHWA Washington
Division*

FHWA Office of Operations' Traffic Control Device Team has posted the official rulings database on the MUTCD website. The official ruling database is a resource for information about FHWA interpretations, experimentations, and changes related to the MUTCD.

The database is a work in progress and still in the first stage of development. The database is in the process of populating more useful information. Next stage of development will include a way for users to view related background information such as FHWA letters of response and incoming correspondence related to the MUTCD.

To locate the official ruling database, visit the MUTCD website at <http://mutcd.fhwa.dot.gov>.



Road Symbols and Pavement Markings

*By Liana Liu, P.E. Traffic/Safety/
T2 Engineer, FHWA Washington
Division*

FHWA Office of Operations' Traffic Control Device Team has developed two new brochures, one for Road Symbols and one for Pavement Markings. These brochures are intended for a general audience and for the purpose of familiarizing people with some of the new signs and pavement markings that they may see during their travel throughout the United States.

FHWA plans to distribute these two brochures together versus separately. The Road Symbols Brochure printing is completed and available in the FHWA Washington Division Office and WST2 Center.



For further information contact Ms. Liana Liu, FHWA, at (360) 753-9553 or Mr. Dave Sorensen, WST2 Center, at (360) 705-7385.

Click It or Ticket 2003



*By Lorie Dankers, Media Relations
Manager, National Highway Traffic
Safety Administration*

The message is simple: Seat belts save lives. And this message is beginning to resonate with Americans. National surveys show that 75% of motorists are buckling up. This pales in comparison to the usage rate in Washington. The most recent survey, which was taken last summer, showed that 93% of Washingtonians were buckled up. This was the highest in the nation and 12% higher than the previous year. Because more people are wearing their seat belts, there are fewer fatalities and serious injuries from motor vehicle crashes.

Why is Washington a leader in seat belt usage? In June 2002 a primary seat belt law was enacted, allowing law enforcement to ticket motorists for not wearing a seat belt. In most other states officers must stop a motorist for some other violation before issuing a ticket for not buckling up. In addition, a

high-profile publicity "Click It or Ticket" campaign was launched across the country in the spring of 2002. In Washington the \$86 fine for violators caught the attention of nearly every resident in the state.

"Click It or Ticket" is back in 2003. Extra seat belt law enforcement patrols will begin May 19. Special emphasis will be placed in areas of the state where there are higher incidents of motor vehicle crashes and fatalities. Consider this your warning. Seat belts are saving lives in Washington and around the country. Don't get an \$86 ticket. Click It or Ticket.



For more information on "Click It or Ticket," please contact Lorie Dankers, Media Relations Manager, at the National Highway Traffic Safety Administration, U.S. Department of Transportation, 915 Second Avenue, Suite 3140, Seattle, Washington 98174, (206) 220-7640, lorie.dankers@nhtsa.dot.gov.

International Snow Science Workshop: “A Merging of Theory and Practice”

*By Peter Lyon, WSDOT BTEP
Coordinator*

Since its inaugural event in 1976, the International Snow Science Workshop (ISSW) has occurred every other year. The goal of this event is to bring together scientists and experienced practitioners in the field of avalanche control to stimulate mutual exchange of ideas and new technology. This year's event was held in Penticton, British Columbia from September 29 through October 4 and brought together over 600 attendees from a total of 28 different countries. The central theme of this year's workshop was “A Merging of Theory and Practice.”

Using funds provided by the Federal Highway Administration's Border Technology Exchange Program (BTEP), Washington State Department of Transportation's (WSDOT) Snoqualmie Pass Avalanche Crewmembers Lee Redden, Ron Gibson, John Stimberis, and Craig Wilbour attended the workshop, which included a mixture of 55 different formal presentations and field observations.

WSDOT has a long history of supporting ISSW and contributing to the field of snow science. This year the Department contributed a poster presentation on “Avalanche Blasting Using Shock Tube and Non-electric Detonators.” WSDOT was the first to use shock tube and non-electric detonators on a regular basis for avalanche control.

At this year's conference, there were up to five research papers presented on of each the following general topic sessions:

- Avalanche Activity and Monitoring
- Avalanche Control and Static Defenses
- Avalanche Dynamics
- Avalanche Forecasting
- Case Histories
- Mountain Snowpack
- Mountain Weather
- Rescue and Survival
- Snow Stability
- Warning Systems and Hazard Mapping
- Wind Transported Snow

In the Mountain Snowpack session, one paper, entitled “A Portable, Variable-speed, Penetrometer for Snow Pit Evaluation,” described how a snow probe is designed to obtain information on the hardness, stability, strength, and temperature gradient of a snowpack in about 3 minutes.

In the Snow Stability session, the discussion centered on a particular type of weak snowpack structure that is usually found at higher elevations in the Colorado Rockies. As precipitation falls, a crust develops on top of the snow that results in a dramatic seven-day avalanche cycle in ski areas. The proactive efforts of the avalanche crew in learning to recognize this

type of hazard and to implement proper avalanche control measures greatly limits the public's exposure to danger.

In the Avalanche Control and Static Defenses session, a Swiss scientist described the analytical process that his government went through to determine the potential winter openings for their high alpine pass roads. This analytical process is similar to WSDOT's problem analysis, maintenance costing, and potential value process, which was used five years ago as a factor in keeping Chinook Pass, Cayuse Pass, and the North Cascades Highway open.

Numerous improvements learned from past years' conferences have already been incorporated into WSDOT's avalanche control program. Examples of these improvements include air blasts and bomb trams that make avalanche control more effective and timely, improved instrumentation and new computer applications for data acquisition, and avalanche control decisions that are based more on data than conjecture. Discussions of mutual problems and issues have improved all phases of avalanche and explosive safety technology. These improvements result in better performance and safety of the avalanche control program and shorter highway closures.



Think Tanks

By Jennifer Boteler, WSDOT Librarian

Librarians are frequently asked for the latest research or cutting edge material on certain topics. In the field of transportation, most people are familiar with federal research and policy organizations and university affiliated research centers, such as the Transportation Research Board, FHWA Turner Fairbank Highway Research Center, the Texas Transportation Institute (Texas A&M), and the Center for Transportation Research and Education (Iowa State University). Another source for scientific research on transportation related topics is public policy research organizations, also known as "think tanks."

Think tanks examine current and future public policy challenges and offer options for meeting them. Think tanks are worldwide covering diverse disciplines. Some provide independent, non-partisan research, while others assume an advocacy role.

When looking at research findings presented by think tanks, you'll want to consider at least two things: their mission and how they are funded. Knowing this, you can determine if they are biased or are advocates for certain policies. In addition to information presented on think tank websites (follow links for "About Us" or "Mission"), another good source for information is the National Institute for Research Advancement's (NIRA's) World Directory of Think Tanks. It is available both in print and online. The web address for the online version is <http://www.nira.go.jp/ice/index.html>.



When looking at research findings presented by think tanks, you'll want to consider at least two things: their mission and how they are funded.

The NIRA Directory gives background/scope information on think tanks and funding sources. For example, are they funded through private donations or corporate donations; grants or endowments; government or labor? Also, do they accept contract research?

Below is a sampling of think tanks in the United States and examples of their recent research reports on transportation related issues. These are meant to be examples; the inclusion of a think tank or publication in this listing does not imply endorsement by WSDOT.

AAA Foundation for Traffic Safety -

<http://aaafoundation.org/home/>

Dedicated to saving lives and reducing injuries by preventing traffic accidents. A not-for-profit, publicly-supported charitable educational and research organization.

Unlicensed to Kill: The Sequel (January 2003) - <http://aaafoundation.org/pdf/UnlicensedToKill2.pdf>

Roughly 20% of the traffic fatalities in this country involve unlicensed drivers whose licenses have been

revoked, suspended, or invalid. This report explains the problems and provides recommendations to enhance driver compliance with licensing laws.

Brookings Institution - <http://www.brookings.edu/>

Independent, nonpartisan organization devoted to research, analysis, education, and publication focused on public policy issues in the areas of economics, foreign policy, and governance.

TEA-21 Reauthorization: Getting Transportation Right for Metropolitan America (March 2003) - <http://www.brookings.edu/es/urban/publications/tea21.htm>

Offers a comprehensive policy framework that calls for a two-step approach to reauthorization. Congress must preserve the innovative framework of ISTEA and TEA-21 and ensure that states attend to the needs of their metropolitan areas. It must also give metropolitan areas more powers and greater tools, in exchange for enhanced accountability, to get transportation policy right for their regions.

Discovery Institute - <http://www.discovery.org>

Discovers and promotes ideas in the common sense tradition of representative government, the free market, and individual liberty.

Transportation Plan for the Future: How do We Get There From Here? : A Transportation Future for the Puget Sound Region (2003) - <http://www.discovery.org/cascadia/CascadiaReport/index.html>

This report brings focus to the [transportation] choices ahead. The Institute advocates a transportation plan based on more government accountability on commerce and conservation linked to increased investment in

technology, along with new, more economical construction practices.

Economic Policy Institute - <http://www.epinet.org/>

Nonprofit, nonpartisan think tank that seeks to broaden the public debate about strategies to achieve a prosperous and fair economy.

Altered States: How the Federal Government Can Ease the States' Fiscal Crisis - <http://www.epinet.org/Issuebriefs/ib187.html>

The recession may have ended, but the fiscal difficulties facing state and local governments persist. Balanced-budget laws are compelling states to increase taxes and cut spending, which will ultimately reduce national economic growth. One way the federal government can alleviate this problem is by providing temporary, general assistance to state and local governments.

Mineta Transportation Institute - <http://transweb.sjsu.edu>

Established by Congress as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Focuses on international surface transportation policy issues as related to three primary responsibilities: research, education, and technology transfer. Receives policy oversight from an internationally respected board of trustees who represent all of the major transportation modes.

Developer-Planner Interaction in Transportation and Land Use Sustainability (June 2002) - <http://transweb.sjsu.edu/pubs.htm>

Current planning and transportation regulations may be discouraging the development of alternative and perhaps more sustainable-land use approaches. As a result, there is a significant unmet need for alternatives to

traditional automobile-oriented development. This study examines the demand for, as well as obstacles to, alternative development at the national as well as local level.

RAND - <http://www.rand.org>

Independent, nonprofit research organization. Founded to further and promote scientific, educational, and charitable purposes for the public welfare and security of the United States.

Technology Transfer of Federally Funded R&D (2003) - <http://www.rand.org/publications/CF/CF187/>

Technology transfer involves the generation of innovative ideas through the sharing of knowledge among federal laboratories, universities, industry, and government, and oftentimes the eventual commercialization of those ideas. By better understanding technology transfer, the government can increase benefits from its investment in new technologies.

Reason Public Policy Institute - <http://www.rppi.org/>

Public policy think tank promoting choice, competition, and a dynamic market economy as the foundation for human dignity and progress.

Contracting for Road and Highway Maintenance (March 2003) - <http://www.rppi.org/htg21.pdf>

State, county, and city governments are grappling with severe budget deficits and looking for ways to cut costs. To assist in this cause, this new Reason Foundation report demonstrates the savings that highway and road maintenance outsourcing can bring and outlines the most effective ways for public officials to go about the privatization process.

Surface Transportation Policy Project - <http://transact.org>

The goal of The Surface Transportation Policy Project is to ensure that transportation policy and investments help conserve energy, protect environmental and aesthetic quality, strengthen the economy, promote social equity, and make communities more livable.

Mean Streets 2002 - <http://transact.tranguard.com>

Latest study in a series that looks at the perils facing pedestrians, why where you live matters, and how states aren't spending enough to fix the problem.

The Road Information Program
– TRIP - <http://www.tripnet.org>

Nonprofit organization that promotes transportation policies which relieve traffic congestion, improve air quality, make highway travel safer, and enhance economic productivity.

Getting Home Safely: An Analysis of Highway Safety in Washington State (September 2002) - <http://www.tripnet.org/research.htm>

This reports looks at the latest traffic fatality data in Washington State, the unique characteristics of these fatalities, the routes with the highest rate of societal costs caused by traffic accidents, and the steps that are needed to reduce traffic deaths in Washington State.



If you would like assistance in obtaining print copies of any of the aforementioned publications, or if you have any questions about think tanks, contact your local public library or the WSDOT Library at (360) 705-7750 or library@wsdot.wa.gov.

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Department of Transportation**

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Contact Stephanie Williams
WSDOT Engineering
WilliSr@wsdot.wa.gov

(360) 705-7430





Technology and the Wireless Evolution

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After years of hearing different and, sometimes, incorrect information about what "wireless" is and is not, I thought it was about time to broaden my perspective and form a more updated opinion of the technology. I have done some work with wireless modems, packet radio, and CDPD (Cellular Digital Packet Data) and felt comfortable with attempting to write a brief article on the subject. What surprised me was to find so much wireless technology available on the market today compared to only a few years ago. As with other technologies, it has also become smaller, faster, cheaper, and packed with more features that are easier to use (or misuse) than ever before.

I also discovered that there now exists better integration between software applications and hardware devices. Compared to other system changes that can be measured in geodetic time, computer technology continues to be evolving at what feels like the speed of light.

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CDPD, which is data transmission technology that was developed for use on cellular networks. I used CDPD as a point-to-point communication tool, with full duplex (two way communication). One advantage is that technologies like CDPD can communicate with modems or devices over relatively long distances on cellular networks without the need for special licensing. Packet radio technology comes in a variety of forms, from systems that require a HAM radio license to operate, to systems that can be purchased commercially without a license. These technologies worked well for the applications I was using, but more than that, it made me aware

that there was more that could be done with various wireless technologies.

The possibility of not having to be physically connected to a network or device had some distinct advantages. It meant that I could monitor the status of or communicate with several devices from a remote location. This saved time and money by not having to install the physical communications infrastructure (wires). I also did not have to pay monthly service charges or manage service providers.

Henceforth, my interest in wireless technologies began, but where to start? There is a plethora of systems on the market today. There are cell phones with PDAs (Personal Data Assistance) and PDAs with cell phones; even GPS (Global Positioning System) and digital cameras are being integrated into these units. The GPS units I use for data collection are starting to be manufactured with wireless connectivity. If this integration continues, a cell phone, camera, and PDA will be added to my GPS data collector.

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Manufacturers are already talking about next generation systems that will be able to handle high-speed broadband and high-definition streaming video, video conferencing, and much more. One of my observations about this technological evolution is that technologies emerge, mature, and integrate. During this on-going process, the principle of survival of the fittest prevails. There are a lot of different tools available, but the hard part is finding the right one for your application, learning how to use it, and hoping it will survive through the life of your project.

So what is wireless? It is a broad array of devices that can communicate with similar types of devices without being physically connected. Whether you are using cellular telecommunications or some type of radio communications, the key in the relationship between the devices is communication. Communication is really what wireless is all about. There are many devices that communicate on different frequencies, use different languages, and can broadcast over various distant ranges. In order to communicate, your devices will need to share a common language

and a carrier signal. This may seem obvious to some, but not all packaging that says “wireless” contains the same family of devices.

Each wireless technology has its own specifications, such as 802.11. Specification 802.11 refers to a family of specifications developed by the Institute of Electrical and Electronics Engineers for wireless LAN technology. Specification 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients. There are several specifications in the 802.11 family. The following information is taken from <http://www.webopedia.com:>

- 802.11 -- applies to wireless LANs and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).
- 802.11a -- an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. 802.11a uses an orthogonal frequency division multiplexing encoding scheme rather than FHSS or DSSS.
- 802.11b (also referred to as 802.11 High Rate or Wi-Fi) -- an extension to 802.11 that applies to wireless LANs and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.
- 802.11g -- applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

Specification 802.11g devices are now being manufactured but finalization of the specification will probably be completed in mid-2003.

Whether you chose Specification 802.11 devices, packet radios, or some type of cellular network, each has its own strengths and weaknesses. For example, when

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you are driving through a tunnel, neither your cell phone nor car radio work well (if at all), but I have used wireless modems in tunnel-type environments very successfully. Wireless modems are typically short-range (1/4-mile or less), line-of-sight, and point-to-point devices. Wireless modems may work well in a tunnel environment, but one of their weaknesses is that they don't handle obstructions very well and have a very limited range.

Knowing a system's limitations and how it works, will help you when choosing a system and diagnosing problems. If you work with any technology, statistically there will be times when your system doesn't work or, even worse, works intermittently. There are times when solar flares, electromagnetic fields, and other “invisible forces” may interfere with signal reception. How do you track “invisible” data packets that are traveling through an invisible medium (air) at speeds near the speed of light? Some days they are harder to track than others. Some communication transmissions can only be “seen” using sophisticated test equipment, but a good working knowledge of your system will help you to

understand why things will or will not work. Many wireless devices use variations of the same concepts, and it only takes a good basic wireless skill set to move from one platform to another.

The more you know about wireless technologies, the easier the transition and the better you will be able to use the tool. For example, some wireless technologies have included a type of data packet checking schema to assure that all the data has arrived and is intact. If a packet fails, the client device requests that another copy be sent from the serving device. There are variations on this theme as you switch manufacturers, but the underlying concepts are the same, packet validation. For my applications, packet validation was an important feature because if a data packet didn't arrive (was dropped) or was damaged, then the calculation in my application would display erroneous data. As you work with wireless technologies, you will find that simple things, such as types of antennas and antenna placement, can be critical to the success of a wireless project.

As with any successful wireless project, there is always the question of security. After all, you are broadcasting your data across open airwaves for the whole world to see. With the right equipment, anyone can listen in; although, some security measures make listening in more difficult. There are the inevitable horror stories of being tapped, hacked, or criminally violated. Unfortunately, many of the horror stories are partially true and some are blown out of proportion, but the real truth is that most of the problems could have been avoided. System or network security is an important "mind set" to have whether you are working with a wired or wireless system.

The following discussion is not designed to protect your system

from attack but to point out some of the vulnerabilities that have plagued others who have used these technologies. Unfortunately, some systems integrators do not take sufficient security measures until after an attack has occurred. Once an attack has occurred, it is difficult to regain the trust that was lost. My hope is to move system security issues from a damage control position to part of the system integration process. Fortunately, with the wireless technology applications I have used, the exposure to attack was very minimal and self-contained.

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System security is really a game of managed risk. There are as many philosophies about how to manage that risk, as there are systems to manage. Tightly locked-down systems have experienced total devastation because their single platform was violated (e.g. Slammer Virus). If you stifle creativity and exploration into new technologies, your agency or company will quickly fall behind and may find itself vulnerable to the very technology it was trying to protect against. The game is risk

management; the stakes are high and it is survival of the fittest.

Obviously, you have enough interest in wireless technology to have gotten this far into the article. I would suspect that there are others, possibly in your own organization, with similar interests. The larger the organization, the more risk there is to manage. It may be only a matter of time when someone buys cheap wireless LAN gear and plugs it into your network to check their e-mail from a remote location. This is why it is so important to take a proactive stand, think through the risks, and develop countermeasures. It may be as simple as educating employees about security issues or using network intrusion detection devices, or it may require security consultants.

Many unsecured APs (Access Points) have been created simply by using hardware devices with factory default settings. Here is a general observation about what I call, "plug and pray" devices. In order to achieve the widest range of connectivity, the least amount of restrictive settings are used. The manufacturer wants their product to work straight from the box. If security functions are available, they may be turned off by default in order to make the system as easy as possible to setup. As a systems integrator, it is important to test and optimize the functionality of the components before integrating into the complete system. Especially with wireless LAN technology, you want to make sure that you are not creating unsecured APs to your network and that you are not broadcasting your LAN traffic over the airwaves so that someone could pick it up.

If I am using CDPD to contact a PTR (Permanent Traffic Recorder) and down loading the hourly traffic volumes, I don't really care if someone picks up the transmission. All I care about is that the technology works and no data

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is lost in the process. In this type of usage, I am not really concerned about security or encryption; the contents of my transmissions are not really exploitable. My biggest concern would be that the computer contacting the PTR is attached to a LAN, and I have inadvertently created an unsecured AP. My second security threat would be from what is known as a "tapper". This is a person who uses another person's resources for their own use. This is much like someone "tapping" into the neighbor's cable TV signal to avoid paying for cable service. There are identification protocols and password security that can be deployed that will easily limit your exposure to this type of threat.

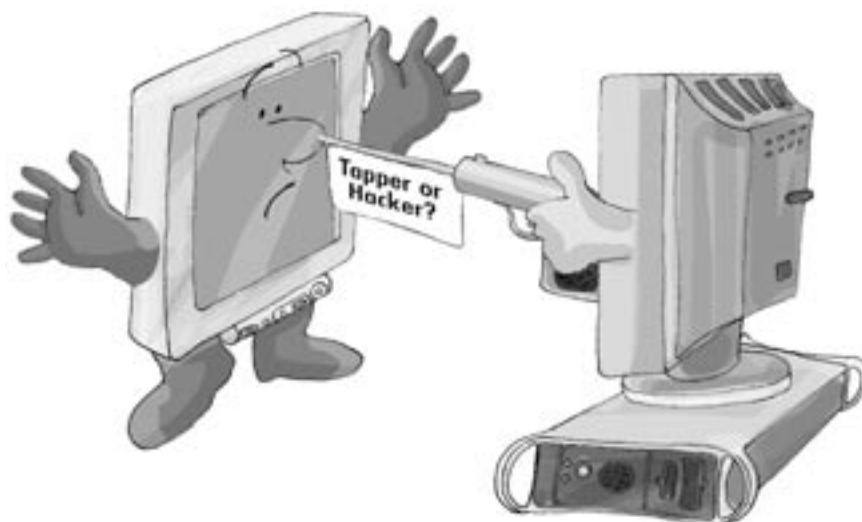
It is important to know your intruders, such as tappers and hackers. The tapper is a relatively benign intruder; they are mostly looking to get a service provided for free. They use "sniffing" programs, such as Net Stumbler or Kismet, to locate access points. NetStumbler can detect if WEP (Wired Equivalent Protocol) security is turned on or off. Many tappers have an ethical code that if you leave WEP turned off, you have made the statement that your system is free and open to the public. Tappers tend to want free Email and Internet access. They are easily discouraged; and therefore, your risk of exploitation is minimal. The saying that a lock is only for an honest man holds true in most cases.

Hackers tend to be more inventive and persistent than tappers. This

group ranges from the ethically moral person to the person with criminal intent. They will use programs like Kismet to crack WEP and WEP encryption. Some hackers go through a locked door to see if it can be done, others do it with criminal intent. Most will quit after encountering some well placed security measures. Those with criminal intent are the most difficult risk to manage. Their reason for persistence seems to fall into two categories: perceived gain or retribution. Perceived gain might be corporate theft or espionage. Retribution is personal; disgruntled or ex-employees are good examples. Perceived gain and retribution are not only risks to wireless networking. If I can walk into your building, set up a laptop in a conference room, and plug into your network with an Ethernet connection, you have a security risk.

Have you ever thought about setting up a vehicle with a laptop, a wireless LAN card, a GPS unit, a high-gain antenna, and a power inverter? Well, even if you haven't thought about it, the hackers have.

They use this equipment to find wireless APs. From a vehicle, this search is called war-driving; from the air, it is called war-flying; and the on-foot version is called war-walking. You need to be aware that your broadcast may reach farther than the manufacturer had anticipated. In war-flying, with no walls or obstructions to impede the signals, there have been reports of network e-mail traffic being intercepted from altitudes above 1500 feet and APs located from much higher. Some related topics to find on the Web are war-jacking, air-jacking, and war-chalking. You will also find many intrusion countermeasures at some of the same WEB locations. With this information, you should be able to test your system using the same tools that a hacker might use. The bottom line is that the harder you make it for an intruder to gain access into your network, the better your security will be. I believe there are many applications that will benefit from the use of wireless technologies, and with proper integration, they will produce great results.





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For questions:

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- 1999 Audio Visual Catalog, T2Center
- 2003 Technology Transfer CD Library: Technical Documents
- Asphalt Pavement Repair Manuals of Practice, SHRP, 1993*
- Asset Management Primer, FHWA, 1999
- A Walkable Community is More Than Just Sidewalks, FHWA, 2000
- Bicycle & Pedestrian Case Studies: No. 7: Transportation Potential & Other Benefits of Off-Road Bicycle & Pedestrian Facilities, FHWA, 1992; No. 14: Benefits of Bicycling and Walking to Health, FHWA, 1993; No. 15: Environmental Benefits of Bicycling & Walking, FHWA, 1993
- Concrete Pavement Repair Manuals of Practice, SHRP, 1993*
- Concrete PASER Manual, University of Wisconsin, 1998
- Contracting for Professional Services in Washington State, MRSC, 1994
- Crack Seal Application, FHWA, 2001
- Data Integration Primer, FHWA, 2001
- Dust Control on Low Volume Roads, FHWA, 2001
- Dust Palliative Selection and Application Guide, USFS, 1992*
- Engineer's Pothole Repair Guide, US Army Corps of Engineers, CRREL, 1984
- Family Emergency Preparedness Plan, American Red Cross, et al., 1999
- Field Guide for Unpaved Rural Roads, Wyoming T2 Center, 1997
- Fish Passage Through Culverts, FHWA, USDA, 1998
- General Field Reference Guide (Pocket Size), 2002
- Geotextile Selection and Installation Manual for Rural Unpaved Roads, FHWA - 1989
- Getting People Walking: Municipal Strategies to Increase Pedestrian Travel, Rhys Roth, Energy Outreach Center
- Gravel Roads – Maintenance and Design Manual, SD LTAP, 2000*
- A Guide to the Federal-Aid Highway Emergency Relief Program, USDOT, June 1995
- Local Agency Pavement Management Application Guide, WST2 Center, 1997*
- A Guide for Local Agency Pavement Managers, NWT2 Center, 1994*
- A Guide for Erecting Mailboxes on Highways, AASHTO, 1984
- Highway / Utility Guide, FHWA 1993
- Improving Conditions for Bicycling and Walking, FHWA, 1998
- Improving Highway Safety at Bridges on Local Roads and Streets, FHWA, 1998
- International State-of-the-Art Colloquium on Low-Temperature Asphalt Pavement Cracking, CRREL, 1991
- Local Agency Safety Management System, WSDOT, 1998, Reprinted 2000*
- Local Low Volume Roads and Streets, ASCE, 1992
- Maintenance of Aggregate and Earth Roads, WST2 Center (1994 reprint)
- Maintenance of Signs & Sign Supports for Local Roads and Streets, FHWA, 2001
- Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, FHWA, 1996*
- New Generation of Snow and Ice Control, FHWA
- Pavement Surface Condition Field Rating Manual for Asphalt Pavement, NWPMA, WSDOT, 1999*
- Pedestrian Facilities Guidebook, WSDOT, 1997
- Planning & Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, TRB
- Pothole Primer – A Public Administrator's Guide, CRREL, 1989
- Recommendations to Reduce Pedestrian Collisions, WSDOT, December 1999
- Redevelopment for Livable Communities, Rhys Roth, Energy Outreach Center, 1995
- Reflective Sheeting Identification Guide, FHWA, 2001
- Signposts for Snow Trails, USDA, 1998
- Soil Bioengineering: An Alternative for Roadside Management, USDA-FS, 2000
- State-of-the-Art Survey of Flexible Pavement Crack Sealing Procedures in the United States, CRREL, 1992
- Streetwise, A Simplified Local Agency Pavement Management System, WSDOT, 2000*
- Superpave System – New Tools for Designing and Building More Durable Asphalt Pavements, FHWA
- Traffic Calming: A Guide to Street Sharing, Michael J. Wallwork, PE, 1993
- Utility Cuts in Paved Roads, Field Guide, FHWA, 1997
- W-Beam Guardrail Repair and Maintenance, FHWA, 1996
- Washington Bicycle Map, WSDOT, 2001
- Wetland Trail Design and Construction, USDA, 2001

- Wildlife Habitat Connectivity Across European Highways, FHWA, 2002

Workbooks and Handouts from WST2 Center Workshops:

- Access Management, Location and Design, FHWA (NHI), 2001
- Application of Geographic Information Systems for Transportation, FHWA (NHI), 1999
- Construction Documentation: Construction Training Manual for Local Agencies, WSDOT, 2003
- Design, Construction and Maintenance of Highway Safety Features and Appurtenances, FHWA (NHI), 1997 (update included)
- Environmental Overview, LAG Manual Chapter 24, WSDOT, 2003
- Handbook for Walkable Communities, by Dan Burden and Michael Wallwork
- Highway Maintenance Welding Techniques and Applications, Tom Cook, Cornell Local Roads Program, 1995
- Pavement Maintenance Effectiveness/ Innovative Materials Workshop Participant's Handbook

Videotapes:

- Driving Modern Roundabouts, City of Lacey, City of Olympia and WSDOT, 2002
- Walkable Communities: Designing for Pedestrians, Dan Burden, \$50/set of 4 videotapes

CD ROM:

- Best Practices for Road Weather Management, FHWA, August 2002
- Building Projects that Build Communities, WSDOT, 2003
- Gravel Roads: Maintenance and Design Manual, SD LTAP, 2000*
- Pedestrian/Bicycle Crash Analysis Tool, FHWA, 1999
- Pedestrian/Bicycle Safety Resource Set, FHWA, 2000

Pavement Preservation: State of the Practice, FHWA, July 2000

Rockfall Catchment Area Design Guide, ODOT, 2002*

Technology Transfer CD Library Technical Documents, 4th Edition, Spring 2003

Non-Credit Self-Study Guides:

These non-credit WSDOT self-study guides may be obtained from the WST2 Center. An invoice will be sent with the books.

Basic Surveying, \$20

Advanced Surveying (metric), \$20

Contract Plans Reading, \$25

Technical Mathematics I, \$20

Technical Mathematics II, \$20

Basic Metric System, \$20

Computer Programs

The following applications may be downloaded from the Washington State Department of Transportation Materials Laboratory's Web page at: www.wsdot.wa.gov/biz/mats/Apps/EPG.htm:

Everseries Pavement Analysis Programs contains three independent modules:

1. Evercalc 5.0 – A FWD Pavement Moduli Backcalculation Program
2. Everstress 5.0 – A Layered Elastic Analysis Program
3. Everpave 5.0 – A Flexible Pavement Overlay Design Program

Important: These programs are updated regularly. Please send your e-mail address to sivanen@wsdot.wa.gov to be included in the mailing list for updates.

Falling Weight Deflectometer (FWD) Area Program - This program is useful in calculating Normalized Deflections Area Value, and Subgrade Moduli from FWD Data. The program is available for download at www.wsdot.wa.gov/biz/mats/pavement/fwd.htm

Bridge

- WSDOT Highways & Local Programs www.wsdot.wa.gov/TA/Operations/BRIDGE/BRIDGEHP.HTM

Environmental

- Environmental Procedures Manual (M31-11) www.wsdot.wa.gov/eesc/environmental/programs/regcomp/ProceduresManual/start.pdf
- Regional Road Maintenance Endangered Species Act Program Guidelines www.metrokc.gov/roadcon/bmp/pdfguide.htm
- National Marine Fisheries Service Species Listings & Info www.nwr.noaa.gov/
- U.S. Fish and Wildlife Service Species Listings & Info <http://endangered.fws.gov/>
- Washington State DNR's Natural Heritage Program Home Page www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm
- FHWA's Environmental Home Page www.fhwa.dot.gov/environment/index.htm

Highways & Local Programs List Serves

- Local Agency Guidelines (LAG) Manual <http://lists.wsdot.wa.gov/guest/RemoteListSummary/LAGG>
- Traffic and Safety Management http://www.t2sms-l@lists.wsdot.wa.gov/guest/RemoteListSummary/T2SMS_L
- Pavement Management http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2PAVE_L
- WST2 Newsletter http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2News_L
- WST2 Training http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2TRNG_L

Infrastructure Management and GIS/GPS

The site below has been established to promote interagency data exchange and resources sharing between local governmental agencies.

Continued on next page

www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/InfrastructureTechnology/InfThp.html

Legal Search

- Search RCWs and WACs
<http://search.leg.wa.gov/pub/textsearch/default.asp>
- City Streets as part of State Highways
www.wsdot.wa.gov/TA/Operations\LAG\CityStreets.html

Local Agency Guidelines (LAG) Manual

<http://www.wsdot.wa.gov/TA/Operations/LAG/LAGHP.htm>

Pavement Management

- Pavement Publications & NWPMA Links
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/PavementTechnology>
- NWPMA - North West Pavement Management Association
www.wsdot.wa.gov/ta/T2Center/Mgt.Systems/PavementTechnology/nwpma.html
- Asphalt Institute
www.asphaltinstitute.org/
- National Asphalt Pavement Association
www.hotmix.org/
- Pavement (A Web Site for Managing Pavements)
www.mincad.com.au/pavenet
- SuperPave Information
www.utexas.edu/research/superpave

Project Development

- Federal Aid Progress Billing Form
<http://www.wsdot.wa.gov/TA/ProgMgt/Projectinfo/BILLFORM.XLS>
- State Funded Progress Billing Form
<http://www.wsdot.wa.gov/TA/ProgMgt/Projectinfo/BILLFORMSTATE.xls>
- STIP (State Transportation Improvement Program)
<http://www.wsdot.wa.gov/TA/ProgMgt/STIP/STIPHP.htm>
- TIP (Local Agency 6-Year Transportation Improvement Program)
<http://www.wsdot.wa.gov/TA/ProgMgt/STIP/TIP.html>

Research

- WSDOT Research Office
<http://www.wsdot.wa.gov/ppsc/research>
- Looking for a Transportation Research Publication?
www.nas.edu/trb/index.html
- Municipal Research and Services Center of Washington
www.mrsc.org

Traffic & Safety

- Safety Management Publications & Information
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/SafetyTechnology/>
- WSDOT Traffic Data Office
<http://www.wsdot.wa.gov/mapsdata/tdo/>
- Washington State Patrol
www.wa.gov/wsp/wsphome.htm
- Washington Traffic Safety Commission
www.wa.gov/wtsc
- National Highway Traffic Safety Administration
www.nhtsa.dot.gov
- American Traffic Safety Services Association
www.atssa.com
- Municipal Research and Services Center of Washington
www.mrsc.org
- Transportation Research Board
www.nas.edu/trb/index.html

Training

- WST2 Classes & LAG Training
<http://www.wsdot.wa.gov/TA/T2Center/Training/>
- WST2 Class Registration
<http://www.wsdot.wa.gov/TA/T2Center/t2hp.html>
- County Road Administration Board
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- Transportation Partnership in Engineering Education Development (TRANSPED)
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Other Online Resources

- Bicycle maps and other information
<http://www.wsdot.wa.gov/TA/PAandI/PAIHP.html>
- Pedestrian information
<http://www.wsdot.wa.gov/TA/PAandI/PAIHP.html>
- Rural Partnerships and scenic byways information
<http://www.wsdot.wa.gov/TA/PAandI/PAIHP.html>
- Better Mousetraps
<http://www.wsdot.wa.gov/ta/T2Center/Mousetraps/>
- Retired Professional Program
<http://www.wsdot.wa.gov/TA/T2Center/Retired.htm>
- Student Referral Program
<http://www.wsdot.wa.gov/TA/T2Center/StudentReferral/>
- LTAP (Local Technical Assistance Program) Clearing House
www.ltapt2.org
- Institute of Transportation Engineers
www.ite.org
- Washington State Counties
<http://access.wa.gov/government/awco.asp>
- Washington State Cities and Towns
<http://access.wa.gov/government/awcity.asp>
- Governor's Office of Indian Affairs
<http://www.wa.gov/goia/index.html>
- Southwest Interagency Coop - Grounds Equipment Maintenance (GEM)
www.gematwork.org

Training Opportunities



*Laurel Gray, WST2
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Contact: Laurel Gray (360) 705-7355
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To register for a class in this section, use the contact listed above.

The class fees shown apply to both public and private sector students. Classes marked with an asterisk (*) are part of the Road and Street Management Training Program and fulfill a portion of the core requirements needed for the Certificate of Achievement in Road Management.

Contract Specification Writing (LAG Program)

September 30, Spokane; November 6, Wenatchee; December 9, Everett. \$50. Instructor: Steve Boesel. This course will provide guidance and methods for writing consistently clear, concise, complete, and well formatted contract special provisions. It will provide attendees with a thought process that can be used when writing or reviewing contract specifications to ensure the greatest possibility for a successful bid and a successful construction project. This course is for persons involved in the writing, reviewing, or enforcing of contract specifications.

Pavement Condition Rating*

September 9-10, Tacoma. \$45. Instructor: Bob Brooks. Participants will learn to rate any of the pavements commonly found in Washington. The rating values

obtained using the definitions and methods learned in this course should compare favorably with those obtained and used in the Washington State Pavement Management System. Each participant should be able to perform a pavement condition survey with reasonable objectivity.

Anatomy of Grant: Grantwriting

August 13-14, Everett; September 23-24, Port Orchard; October 21-22, Moses Lake; November 4-5, Snoqualmie Pass. \$150. Instructor: Sharon Bridwell and Associate. In this two-day workshop you'll learn practical steps to take toward grantwriting and how to approach the right funders for the dollars you need. The class will discuss writing three types of grants: federal, state, and foundations.

Design and Construction of Concrete Pavements*

October 28, Spokane. Free. Instructor: Jim Powell, American Concrete Pavement Association. The course will cover the key considerations related to design, construction, and materials for concrete streets and local roads. Topics covered will include thickness design, joint layout, construction inspection, and materials quality, proportioning, and performance. Special emphasis will be placed on ultra-thin whitetopping, a relatively new technique for overlaying urban streets, rural roads, parking areas, intersections, and light duty airports.

Preservation of Asphalt Pavements*

October 7, Tacoma; October 9, Spokane. \$100. Instructor: John Duval, Asphalt Institute. This course intends to familiarize attendees with the basic principles involved in the preservation of asphalt pavements. The workshop will introduce the concepts of preventive maintenance, the benefits and challenges of implementing a preventive maintenance program, and various techniques for prolonging the life of asphalt pavements. Emphasis will be on the successful planning and implementation of maintenance activities over a pavement's life rather than conducting "reactive" repairs on a "worst-first" basis. Topics will include the typical pavement lifecycle, recognizing pavement distresses, recognizing appropriate candidates for pavement preservation, and selection and execution of appropriate preventive maintenance methods. Extra attention will be given to the use of Thin Hot-Mix Asphalt Overlays as a pavement preservation technique.

Writing Skills*

November 5-6, Tacoma. \$110. Instructor: Jordon Peabody. This workshop is designed to reduce the

confusion caused by the poorly written word. Anyone who must write on the job (but is not a writing pro) will find the training both pleasant and helpful. Writing techniques apply to letters, manuals, speeches, memos, newsletters, e-mail, proposals, reports, bulletins, and minutes.

Advanced Biological Assessment Preparation*

October 16, Lacey. \$35. Instructor: Marion Carey. Topics include biological assessment content, information analysis, making appropriate effect determinations, and common problems found in biological assessments. It will also cover conducting Essential Fish Habitat consultations. Students will come away with an understanding of how to complete the contents of the biological assessment, such as how to define the action area, and how to make and document effect determinations. Prerequisite: Introduction to ESA and Biological Assessments, or an understanding of the ESA and some experience writing biological assessments.

Introduction of GPS Mapping Grade Equipment

\$325. This is a special request class. Four to six students per session. Instructor: Max Schade. This is an introductory course on mapping grade GPS equipment and is taught by a Trimble-certified instructor. It is designed to provide basic knowledge and skills in the use of GPS technology in mission planning, data gathering, and data processing. The training will enable field operation personnel to use new methods and Trimble mapping grade equipment as well as understand problems encountered when using the GPS satellite constellation.

Appraisal Review Workshop (LAG Program)

July 16-17, Moses Lake. \$100. Instructor: Jim Salter, WSDOT Real Estate Office. Eminent domain appraisal review for projects using federal highway dollars is a narrow specialty within the appraisal and right of way profession. Many individuals performing these duties do so on only an occasional or part-time basis. Attendees will leave the class with an improved appreciation of appraisal review requirements, the ability to recognize and solve everyday eminent domain appraisal issues, and a common understanding of the needs of local agencies.

Cultural Resources Workshop

Mid-October, The Dalles, OR. \$325. Class runs from Tuesday through Friday noon. This class provides an

exceptional opportunity to work with the region's most qualified instructors in cultural resources. There will be discussions on Native American perspective on cultural resources, state archaeology, prehistory of Washington, Native American ethnobotany, and federal and state cultural resource regulations and how they apply to your agency.

Purchasing, Bidding and Contract Management

July 16, Sequim; October 8, Moses Lake; October 22, Mt. Vernon; November 12, Lacey. \$50. Instructor: John Carpita, MRSC. Topics include: Purchasing Policies and Procedures, RFPs vs. Bids, To Bid or Not to Bid, Prevailing Wage Issues, Bonding and Insurance Requirements, and Consultants.

Snow and Ice Control Chemicals

September 16, Seattle; September 17, Tacoma; September 18, Chehalis; September 23, Wenatchee; September 24, Yakima; September 25, Walla Walla. No Fee. Instructor: WSDOT Maintenance Office. Sessions will cover the difference between anti-icing and deicing, when each is appropriate for use, and how to use each method correctly. Also included is Total Storm Management.

Right of Way Plans Preparation (LAG Program)

September 9, Seattle area; September 16, Olympia; October 7, Vancouver; October 14, Wenatchee; October 15, Yakima; October 16, Spokane; November 4, Seattle; November 6, Olympia. 8:00 am to 12:00 pm. \$50. This course will give attendees a general overview of the different elements involved in preparing right of way plans and other mapping required for the acquisition of real property or property rights from private individuals and/or other government agencies.

3rd Annual Concrete Workshop

June 4, Ellensburg. \$35. This workshop will provide basic knowledge of concrete mixes, admixtures, and specifications. It will help the contract administrator, inspector, or project manager determine what cylinder test results mean, what information should be evaluated when reviewing a mix design, what is ASR, and what is needed to insure a good service life out of your concrete.

Local Agency Guidelines (LAG) Training

Unless otherwise stated, the courses in the LAG program are free.

- **Consultants:** LAG Manual Chapter 31. Training is in development by University of Washington and will be available in winter 2003. There will be a cost; however, it is undetermined at this time.
- **DBE/EEO/OJT:** LAG Manual Chapters 26 and 27. This class will provide local agencies with a basic understanding of the rules and procedures on Disadvantaged Business Enterprise (DBE), Equal Employment Opportunity (EEO), and On-the-Job Training (OJT) for federally funded projects.
- **Contract Specification Writing:** LAG Manual Chapters 42-46. Three sessions now scheduled. See page 63 for dates.
- **Emergency Relief Programs:** LAG Manual Chapter 33. Curriculum is expected to be complete by winter 2003. The course covers instruction on procedures applicable to emergency projects funded by the Emergency Relief Program on federal-aid highways, and by the Federal Emergency Management Agency disaster assistance for projects not on federal-aid highways. This will be a one-hour, on-line CD course.
- **Enhancement Program:** Training for this course will take place after the new Federal Act is in place.
- **Right of Way Procedures Workshop:** LAG Manual Chapter 25 and the Federal Perspective. There will be no classes scheduled in 2003.
- **LAG Manual Overview:** This course will give a basic overview of the Local Agency Guidelines Manual and the latest revisions. Classes to be held fall 2003, east and west side.
- **Appraisal Review Workshop:** LAG Manual Chapter 25. Classes were held in spring 2003. More will be scheduled in response to the request list.
- **Construction Documentation:** LAG Manual Chapters 51-53. Training for this year has been completed. Next year's sessions will begin in December 2003 and continue into April 2004.
- **Environmental/Introduction:** LAG Manual Chapter 24. This includes Section 106 Process. Eight classes were held this spring. The title of the class is "Environmental Overview for Local Agencies."
- **Right of Way Plans Preparation:** LAG Manual Chapter 25 and the Federal Perspective. This is a new course in the LAG training program. See page 64 for description, dates, and locations. Instruction by WSDOT Real Estate Office.

The "Funding Workshop" has been removed from the LAG training program.

Please let us know if you have an interest in any of the courses listed above by logging on to our web

site at <http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm> and accessing the on-line request list. Click on "WST2 On-line Request," fill out the form, and send. Individual classes will be developed in response to the request list.

If you have questions about the LAG Program, contact Ron Pate at (360) 705-7383 or Laurel Gray at (360) 705-7355.

The Endangered Species Act 4(d) Training Program

The Regional Road Maintenance ESA 4(d) training program is now in its second year. Since March 2002, about 1,200 maintenance supervisors, engineers, environmental staff, crew leads, and crew members have participated in the training program. While the classes have been scheduled primarily for the agencies that have committed to the Regional Road Maintenance Program (RRMP) Guidelines and have submitted a "Part 3 Application," the classes have been made available for anyone requesting this training. The goal of the program remains to serve all maintenance personnel who are interested in expanding their roadway maintenance knowledge and skills and, in particular, learn more about the improved "Best Management Practices" in roadway maintenance.

The Part 3 Application, which is a commitment to ten program elements (of which the training program is Element #4), can be obtained from the following web site: <http://www.metrokc.gov/roadcon/bmp/pdfguide.htm> or by contacting Janine Johanson at METRO KC (206) 205-7101.

The University of Washington's Transportation Professional Development Program (TRANSPEED) is coordinating and presenting the training program. The current series of training tracks are described here. Fees for each track are not given pending possible legislative changes. For program information or course registration, please contact Julie Smith at (206) 543-5539 or by e-mail: jsmith@engr.washington.edu. Those interested may also find program updates, information, and registration at: <http://www.engr.washington.edu/~uw-epp/esa/reginfo>.

Four ESA Training Tracks

The ESA Training Plan has been grouped into four separate tracks: (1) a briefing for regional level decision makers; (2) a training course addressing maintenance design and technical staff procedures involved in roadway maintenance activities; (3) a training course addressing field crew practices involved in roadway maintenance activities; and (4) a course to train agency level trainers in training skills applicable to the ESA training program.

- Track 1: Briefing for Regional Decision Makers 2 hours. No fee. An overview of the ESA program for regional level management and administration. This is a stand-alone training class and not part of the required training program and is offered by members of the Regional Road Maintenance Forum. Call Roy Harris or Gerry Crum at (425) 257-8800 for information. Information may also be obtained from the web site or by calling Janine Johanson at METRO KC (206) 205-7101.
- Track 2: Introduction, Design and BMP's, Monitoring, and Environmental Roles for Technical and Scientific Staff 1.4 CEUs. This course is a combination of the various procedures for technical, professional and environmental staff, supervisors, and leads involved in maintenance activities. The track is an overview addressing introduction to the Guidelines, design, habitat, ten program elements, and maintenance BMPs to meet ESA requirements.
- Track 3: Introduction and Outcome-based Road Maintenance 0.7 CEUs. This course is a combination of the various procedures for field crews and leads involved in maintenance activities. The track is an overview addressing introduction to the Guidelines, design, habitat, environmental roles, ten program elements, and implementation of maintenance BMPs to meet ESA requirements.
- Track 4: Train-the Trainer for the Regional Maintenance Program. 1.4 CEUs. For agency-selected ESA trainers. This is the training track to train skills and techniques, evaluate, prepare, and certify candidates to teach the RRMP class (Tracks 2 and 3) and field demonstrations for BMP installations.

Looking to the Future

During the past year, the Regional Road Maintenance training program has focused primarily on ESA issues related to fisheries in the Puget Sound region. Recently, the program training has been requested and is being offered in Jefferson, Whatcom, and other counties and locations. In addition, the University of Washington has been asked to furnish and has supported instructional assistance and teaming with new Track 4-trained instructors, who are beginning to train within their respective agencies.

Expanding the program further has indicated it may have far reaching applications and venues. The program was developed by a team of state, local, and university experts to provide a comprehensive outline of good management practices applicable in any area. It

has become apparent that the training is appropriate for all roadway agencies who may be seeking a consistent and environmentally sound roadway maintenance program. Course attendees benefit from learning the applications, procedures, and practices while working in teams of peers to develop routine maintenance techniques to the roadway site and design, recognize site conditions, and select BMPs. Proposals have been submitted to the legislature to approve, support, and continue this training program through the 2003-05 biennium.

AASHTO Roadside Design Guide, Web Based Training

NHI Course Number: 380032C

This web-based course is approximately 14 hours long and is available anytime - 24 hours, 365 days a year via the Internet. The cost for non-FHWA employees is \$230 per participant and includes a copy of the 2002 AASHTO "Roadside Design Guide". This course provides an overview of the 2002 AASHTO "Roadside Design Guide." Emphasis is on current highway agency policies and practices. Participants must register online at www.nhi.fhwa.dot.gov/registerdl.asp

Computer Requirements: You will need a fairly recent version of a browser (such as Internet Explorer 4 or 5 or Netscape 4 with JavaScript enabled), the latest version of Macromedia Shockwave and Flash (which you can download from the Internet), and a connection to the Internet (at least 56K modem). An older computer such as a Pentium 100 would work but, it would be slower than a Pentium III. For more information visit <http://www.nhi.fhwa.dot.gov>

TRANSPEED University of Washington

Contact: Christy Pack
(206) 543-5539, fax (206) 543-2352
<http://www.engr.washington.edu/~uw-epp/>

To register for a class in this section, use the contact listed above.

The prices in this section are for local agency / non-local agency.

The Summer and Fall 2003 TRANSPEED schedule is currently under development. If you have questions or requests for a specific course, please contact Christy Pack. The schedule will be published on the above Web site by June 1.

Traffic Engineering Operations-Revised Course

June 16-18, Lacey. \$320/\$520.

Traffic Signal Design

June 11-13, Seattle. \$400/\$585.

Work Zone Traffic Control Plan (TCP) Design

June 25-27, Seattle. \$370/\$570.

Engineering Professional Programs (EPP) University of Washington

Contact: Emily West
(206) 543-5539, fax (206) 543-2352
<http://www.engr.washington.edu/~uw-epp/>

To register for a class in this category use the contact listed above.

Cold Regions Engineering Short Course

August 7-11; October 30-November 3, Seattle. \$1,295 early registration/\$1,355 late registration.

Engineering Refresher Courses

Three evening courses provide thorough preparation for state of Washington engineering examinations.

- E.I.T./Fundamentals of Engineering Exam Review, September 3-October 13 Mondays & Wednesdays, 6:30-9:00 p.m., University of Washington campus, Seattle. \$495.

- Mechanical P.E. Exam Review, September 4-October 14, Tuesday & Thursdays, 6:30-9:00 p.m., University of Washington campus, Seattle. \$645.

- Civil P.E. Exam Review, September 9-October 14, Tuesdays & Thursdays, 7:00-9:30 p.m., University of Washington campus, Seattle. \$495.

Associated General Contractors of Washington

Contact Education Foundation
(206) 284-4500, fax (206) 284-4595
<http://www.agcwa.com>

To register for a class in this category use the contact listed above.

Construction Site Erosion and Sediment Control Certification

These WSDOT approved classes are presented by the AGC and available on the following dates: May 21-22, Renton; June 24-28, Olympia.

- Recertification requires attendance on Day 1 only, successfully completing exam, and proof of previous WSDOT certification. Recertification cost is \$150. You can check your certification with the on-line database as proof of certification.
- Certification training has been changed from a full two days to one and one-half days. Initial certification is \$250.
- Certification requires successfully completing end of course exam.

TRB 2003 Summer Meeting - Committee on Historic and Archaeological Preservation in Transportation (A1F05)

July 27-30, Vancouver, WA. Contact Pam Trautman, WSDOT Environmental Office, at (360) 570-6638 or trautmp@wsdot.wa.gov.

2003 Institute of Transportation Engineers (ITE) Annual Meeting

August 24-27, Seattle, WA. Contact Donna Fort, ITE, at (202) 289-0222 or dford@ite.org.

Washington State & British Columbia Chapters Joint APWA Fall Conference

September 16-19, Penticton, BC, Canada. Contact Bob Moorhead, TIB, at (360) 586-1151 or robertm@tib.wa.gov.

12th Northwest On-site Wastewater Treatment Short Course and Equipment Exhibition

September 22-23, Seattle, WA. See the Web site at <http://www.engr.washington.edu/epp/wwt>.

Footprints & Bike Tracks 2003: Creating Safe and Healthy Communities

September 23-25, Olympia, WA. Contact Paula Reeves, WSDOT Bicycle & Pedestrian Program, at (360) 705-7258 or reevesp@wsdot.wa.gov. Registration will be available on-line after June 1 at www.bicyclealliance.org.

Road and Street Maintenance Supervisor's School

East: September 30-October 2, Spokane Valley;
West: December 2-4, Tacoma. Contact Kelly Newell, Washington State University, at 1-800-942-4978.

WA Chapter of American Planning Association and WA Trust for Historic Preservation Joint Conference

October 13-15, Spokane, WA. Contact Susan, AICP, at (509) 477-4237 or swinchell@spokanecounty.org.

Northwest Pavement Management Association Conference

October 21-23, Vancouver, WA. Contact Bob Brooks, WSDOT WST2 Center, at (360) 705-7352 or brookbo@wsdot.wa.gov.

16th Annual Heritage Conference

October 22-24, Richland, WA. Contact Mark Vessey at (360) 586-0219 or mvessey@wshs.wa.gov.

43rd Annual Idaho Asphalt Conference

October 23, Mosco, ID. Contact University of Idaho Conference Services 1-888-884-3246.

Infrastructure Assistance Coordinating Council (IACC)

October 28-30, Wenatchee.

APWA Spring Conference 2004

March 23-26, 2004, WestCoast/Red Lion, Olympia. Contact Bob Moorhead at (360) 586-1151 or the APWA Web site at www.apwa-wa.org.

Pacific Northwest Transportation Technology Expo

May 18-19, 2004, Grant County Fairgrounds, Moses Lake. Contact the WST2 Center at (360) 705-7386.



Old Meets New

Here's an interesting sign Clay Wilcox, Assistant Maintenance Superintendent at the WSDOT Port Orchard Shop, and his wife Loretta came across in the British Isles during their recent vacation. Thanks Clay and Loretta.



Sign of the Times

Do you have a humorous traffic sign to share? Send us a print or e-mail a digital image (preferably a 300 dpi, 1000x1500dpi jpeg or tif) and we will add it to our collection for publishing. Please provide your name, title, agency or company, and a short description of where and when you saw the sign. We want to give you credit for your participation.

You can e-mail the image to SundeD@wsdot.wa.gov

Or mail the photo to:
"Sign of the Times"
WST2 Center
PO Box 47390

Please don't send your original photo. Although we will do our best to return the photo, we can't guarantee it.

Washington State Technology Transfer

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